

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
 United States Patent and Trademark  
 Office  
 Box PCT  
 Washington, D.C. 20231  
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 11 October 2000 (11.10.00)	
<b>International application No.</b> PCT/IL00/00114	<b>Applicant's or agent's file reference</b> 123419.4 LK
<b>International filing date (day/month/year)</b> 23 February 2000 (23.02.00)	<b>Priority date (day/month/year)</b> 24 February 1999 (24.02.99)
<b>Applicant</b> YAMAI, Yehuda	

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

13 September 2000 (13.09.00)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
 34, chemin des Colombettes  
 1211 Geneva 20, Switzerland

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Authorized officer

Manu Berrod


Telephone No.: (41-22) 338.83.38

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>123419.4 LK</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/IL00/00114</b>	International filing date (day/month/year) <b>23/02/2000</b>	Priority date (day/month/year) <b>24/02/1999</b>
International Patent Classification (IPC) or national classification and IPC <b>B65B31/02</b>		
Applicant <b>HEFESTUS LTD. et al.</b>		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 12 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I    <input checked="" type="checkbox"/> Basis of the report</li> <li>II   <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV   <input type="checkbox"/> Lack of unity of invention</li> <li>V    <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI   <input type="checkbox"/> Certain documents cited</li> <li>VII <input checked="" type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul>		
Date of submission of the demand  <b>13/09/2000</b>	Date of completion of this report  <b>05.08.2001</b>	
Name and mailing address of the international preliminary examining authority:   <b>European Patent Office - P.B. 5818 Patentlaan 2          NL-2280 HV Rijswijk - Pays Bas          Tel. +31 70 340 - 2040 Tlx 31 651 epo nl          Fax +31 70 340 - 3016</b>	Authorized officer  <b>Grentzius, W</b>  Telephone No. +31 70 340 3728	



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IL00/00114

## I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

### Description, pages:

1,2,4,6	as originally filed	
3,5,7-9	with telefax of	14/02/2001

### Claims, No.:

1-16	with telefax of	14/02/2001
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### Drawings, sheets:

1/11-4/11,7/11,8/11, 11/11	as originally filed	
5/11,6/11,9/11, 10/11	with telefax of	14/02/2001

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IL00/00114

listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description,      pages:
- ☐ the claims,          Nos.:
- ☐ the drawings,        sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims 2
	No: Claims 1,3-16
Inventive step (IS)	Yes: Claims
	No: Claims 1-16
Industrial applicability (IA)	Yes: Claims 1-16
	No: Claims

**2. Citations and explanations**  
**see separate sheet**

**VII. Certain defects in the International application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IL00/00114

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: WO 91 03400 A

D2: FR 2 597 833 A

D3: EP 0 469 296 A

D4: WO 96 24470 A

2.1. Document D1 discloses a method and an apparatus for packaging a product in a hermetically sealed container having a cup-shaped or semi-rigid body with a rim fitted with a closure, the method and apparatus comprising all the features of present claims 1 and 3-16.

Document D2 also discloses the subject matter of independent claims 1 and 7 as well as that of dependent claims 3,4,6,8,9,11-13 and 15.

Documents D3 and D4 both disclose a method in accordance with claims 1,3,4 and 6.

The subject matter of claims 1 and 3-16 therefore lacks novelty.

2.2. With regard to the above novelty objection the following should be noted:

2.2.1. In the method and apparatus of D1, D2 and D4 the isolated space between the body and the closure forming member is evacuated prior to introduction of the replacement gas. The wording of the claims of the present application, however, does not exclude such an evacuation. All the method steps of claim 1 and the corresponding structural features of claim 7 are disclosed in D1, D2 and D4.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IL00/00114

- 2.2.2. In column 3, lines 4-6, document D3 discloses that in order to flush air from the isolated space vacuum is applied to one inlet while an inert gas is applied to another inlet. Here the applied vacuum serves the purpose of assisting in flushing air from the space, rather than of evacuating the space. Such an arrangement is also foreseen in the embodiment of Figure 5 of the present invention (see page 9, lines 9-11). The disclosure of D3 therefore anticipates the method of claims 1, 3, 4 and 6.
- 2.2.3. Also the question whether the above prior art devices require the use of a evacuation chamber for the containers is irrelevant. Also an evacuation chamber forms an isolated space in terms of the claims. Furthermore, the embodiment of Figure 5 of the present application also has an evacuation chamber (604).
3. As it is well-known to package pasty food products such as dairy products in similar sealed cup-shaped containers, it would be obvious to a person skilled in the art, namely when the same result of increasing product shelf-life is to be achieved, to use the method of any of the above documents for the packaging of pasty products. He would thus arrive at a method according to claim 2 without the exercise of any inventive skill.

**Re Item VII**

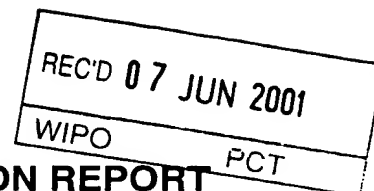
**Certain defects in the international application**

4. The reference signs used in the claims should have been put between brackets (Rule 6.2(b) PCT).

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)





Applicant's or agent's file reference 123419.4 LK	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IL00/00114	International filing date (day/month/year) 23/02/2000	Priority date (day/month/year) 24/02/1999
International Patent Classification (IPC) or national classification and IPC B65B31/02		
Applicant HEFESTUS LTD. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
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These annexes consist of a total of 12 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  13/09/2000	Date of completion of this report  05.06.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer  Grentzius, W  Telephone No. +31 70 340 3728 

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IL00/00114

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

### Description, pages:

1,2,4,6	as originally filed	
3,5,7-9	with telefax of	14/02/2001

### Claims, No.:

1-16	with telefax of	14/02/2001
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### Drawings, sheets:

1/11-4/11,7/11,8/11, 11/11	as originally filed	
5/11,6/11,9/11, 10/11	with telefax of	14/02/2001

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IL00/00114

listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description,      pages:
- ☐ the claims,      Nos.:
- ☐ the drawings,      sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2
	No:	Claims	1,3-16
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-16
Industrial applicability (IA)	Yes:	Claims	1-16
	No:	Claims	

2. Citations and explanations  
see separate sheet

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
see separate sheet

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: WO 91 03400 A

D2: FR 2 597 833 A

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D4: WO 96 24470 A

2.1. Document D1 discloses a method and an apparatus for packaging a product in a hermetically sealed container having a cup-shaped or semi-rigid body with a rim fitted with a closure, the method and apparatus comprising all the features of present claims 1 and 3-16.

Document D2 also discloses the subject matter of independent claims 1 and 7 as well as that of dependent claims 3,4,6,8,9,11-13 and 15.

Documents D3 and D4 both disclose a method in accordance with claims 1,3,4 and 6.

The subject matter of claims 1 and 3-16 therefore lacks novelty.

2.2. With regard to the above novelty objection the following should be noted:

2.2.1. In the method and apparatus of D1, D2 and D4 the isolated space between the body and the closure forming member is evacuated prior to introduction of the replacement gas. The wording of the claims of the present application, however, does not exclude such an evacuation. All the method steps of claim 1 and the corresponding structural features of claim 7 are disclosed in D1, D2 and D4.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IL00/00114

- 2.2.2. In column 3, lines 4-6, document D3 discloses that in order to flush air from the isolated space vacuum is applied to one inlet while an inert gas is applied to another inlet. Here the applied vacuum serves the purpose of assisting in flushing air from the space, rather than of evacuating the space. Such an arrangement is also foreseen in the embodiment of Figure 5 of the present invention (see page 9, lines 9-11). The disclosure of D3 therefore anticipates the method of claims 1, 3, 4 and 6.
- 2.2.3. Also the question whether the above prior art devices require the use of a evacuation chamber for the containers is irrelevant. Also an evacuation chamber forms an isolated space in terms of the claims. Furthermore, the embodiment of Figure 5 of the present application also has an evacuation chamber (604).
3. As it is well-known to package pasty food products such as dairy products in similar sealed cup-shaped containers, it would be obvious to a person skilled in the art, namely when the same result of increasing product shelf-life is to be achieved, to use the method of any of the above documents for the packaging of pasty products. He would thus arrive at a method according to claim 2 without the exercise of any inventive skill.

**Re Item VII**

**Certain defects in the international application**

4. The reference signs used in the claims should have been put between brackets (Rule 6.2(b) PCT).

The present invention provides, by a first of its aspects, a method for packaging a product in a hermetically sealed container having a cup-shaped rigid or semi-rigid body with a rim fitted with a closure, the method comprising:

- (a) introducing the product into said cup-like shaped body;
- 5 (b) forming an isolated space with a gas inlet and a gas outlet, the space defined between said body and a closure-forming member adjacent to and with a clearance from said rim;
- (c) introducing a replacement gas through said inlet to replace at least a substantial portion of gas originally contained in said isolated space;
- 10 and
- (d) displacing at least one of said body or said closure-forming member towards the other of the two members to close said clearance and to attach the closure-forming member to said rim, and hermetically attaching the two to one another to form a gas-tight ~~seal~~ **seal**.

15 As will be appreciated, steps (a) and (b) may be performed one after the other in the given order; may be in their reversed order, namely first forming the isolated space and then introducing the product ~~is introduced~~ into the container within such space; or the two steps may be carried out simultaneously.

By its second aspect, the present invention provides an apparatus for  
20 forming a hermetically sealed product-containing container, the container having an essentially cup-like shaped body with rims fitted with a closure; the product not filling the entire container leaving residual space therein; the apparatus comprising:

- a holder for holding said container body;
- a spacer member sealingly engageable with said holder and with a  
25 closure-forming member, and having an opening; in a state of seal engagement of said spacer member with said holder and said closure-forming member, said opening, said container body and said closure-forming member, define together the isolated space;
- a gas inlet and a gas outlet for introducing a replacement gas into said  
30 isolated space, and exhausting gas therefrom, respectively; and

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Alternatively, the gas outlet may also be constituted by bores within said spacer member.

The gas inlet is typically formed within said spacer member. The gas inlet preferably comprising a plurality of nozzles. Where the gas outlet is formed in said spacer, such nozzles will usually be formed in portions of the spacer member other than portions hosting the gas outlet bores. The nozzles will usually be directed into the isolated space so as to ensure sufficient turbulence for effective flushing of the residual space with the replacement gas.

### BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, preferred embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Fig. 1 is an exploded view of an apparatus in accordance with a preferred embodiment of the invention.

Fig. 2 is an isometric view of the apparatus of Fig. 1.

Figs. 3A-4A shows the apparatus of Fig. 1 in several operational steps, where Figs. 3A-3E are partially cut, isometric views, and Figs. 4A-4F are partial and cross-sectional longitudinal views of the apparatus in corresponding operational steps.

Fig. 5 is an exploded view of an apparatus in accordance with another embodiment of the invention.

### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is first being made to Figs. 1 and 2 showing an apparatus in accordance with an embodiment of the invention. Fig. 1 shows the apparatus generally designated 100, in an exploded view. Fig. 2 shows an apparatus as a workstation in a packing line generally designated 102. The apparatus 100 comprises, as can best be seen in Fig. 1, a holder 104 for holding a rigid or semi-rigid cup-shape container body 106, received within opening 108 fitted with an upright

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As can best be seen in Fig. 2, the apparatus is fed with a continuous film 200 constituting a closure-forming member, which extends between spacer 130 and film pressing plate 154. In a manner to be described further below, the used film exiting the apparatus and fed to a pickup spool (not shown) has cutouts 202  
5 resulting from cutting out a portion used for closure of the container.

The operation of the apparatus will now be described with reference to Figs. 3A-4F.

A first step of operation can be seen in Figs. 3A and 4A. Container body 106, having in this specific embodiment inverted frustoconical shape, is received within holder 104 with the container's rim 107 resting over skirt 110. A  
10 film sheet 200 is tensioned between the spacer member 130 and film pressing plate 154 with sealing and trimming mechanism 150 being in a state such that plate 160 is distanced from the film. Film pressing plate 154 is displaced axially in its downward direction by means of the pneumatic or hydraulic pistons 182 and  
15 184, extracting and retracting the respective piston rods 186 and 188 and which are articulated at bores 190 and 192, respectively to the plate 154.

At a next stage seen in Figs. 3B and 4B, the holder 104 and the remaining part of apparatus 100 are mutually displaced (either by elevating holder 104 or by lowering the reigning parts of the apparatus) so as to bring to engagement of spacer  
20 member 130 with peripheral portion 109 (Fig. 4A), with an O-ring 111 fitted within a groove at a bottom face of spacer member 130, ensuring that the attachment will be in a gas-tight manner (not permitting gas passage through interface between these two bodies.

In a next step shown in Figs. 3C and 4C, pressing plate 154 is lowered by  
25 means of piston rods 186 and 188, whereby the film is pressed between juxtaposed faces of plate 154 and upper face of spacer 130. The O-ring 190 received within groove in the upper face of spacer member 130, ensures a gas-tight seal between film 200 and the spacer member. In this manner, an isolated space 204 defines  
is defined

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IPEA/EP

between the container body 106, the film 200 and wall surfaces of holder 104 and spacer member 130.

Container body 106 contains a pasty food product, e.g. a dairy product 122 filled up to a certain level and leaving a residual space 210 between the upper face  
5 of the pasty food product 122 and the container's rim 107.

In the next step, seen in Fig. 4D, a replacement gas is introduced through nozzles 134 to generate a turbulent flow represented schematically by solid, curved  
10 arrowed lines 216, resulting in flushing of the residual space <sup>210</sup> with the replacement gas. At the same time, gas is evacuated to the external atmosphere through bores 112, as represented schematically by dashed curved arrowed lines 218. In this  
specific embodiment the nozzles <sup>134</sup> are at a level which is below that of the rim 107 of  
the container <sup>body 106</sup>. This is in order to avoid direct blow of air jets on the food product <sup>122</sup>,  
which can cause the formation of an aerosol which is undesired. It should however  
be appreciated that this position of the nozzles <sup>134</sup> is but an example and in other  
15 embodiments there may be other positions of the nozzles <sup>134</sup> including such above the  
rim's level.

A subsequent step can be seen in Figs. 3D and 4E in which a sub-assembly consisting of plate 166, welding plate 160 and trimming member 180 is lowered  
towards the film 200, pushing the film 200 downwards to tightly engage rim 107  
20 while the heat generated by plate 160 <sup>causes</sup> the film to weld to the rim. Plate 160  
is downwardly biased by means of coiled-spring pistons 164 and thus the lower  
face of member 160 is at a lower level than the cutting edge 181 of trimming  
member 180. This axial displacement of the sub-assembly is achieved by means of  
piston rod 177 extending out of piston member 176.

25 At a next step, seen in Figs. 3E and 4F this sub-assembly continues its  
downward movement, represented by arrows 226 in Fig. 4F, causing compression  
of the spring within piston 164, bringing to an additional downward pressure for  
better sealing of film 200 onto rim 107, this downward displacement bringing to  
lowering of trimming edge 181 of trimming member 180 so as to trim film 200.

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IPEA/EP

*sealed body 100* - 9 -

Thereby, a container ~~122~~<sup>a</sup> where the residual space 210 is filled with ~~the~~<sup>a</sup> replacement gas, is formed. X

Reference is now being made to Fig. 5 showing another embodiment in accordance with the invention. The apparatus 300 in accordance with this  
5 embodiment is identical at most of its components to the embodiment of Fig. 1 X  
and only the differences will be outlined hereinbelow. Hereinbelow, when reference will be made to like components, they will be designated by the same reference numeral as used in the embodiment described above, shifted by 200.

Spacer member 330 is provided with a replacement gas inlet 336 and a gas  
10 outlet 600 leading to a vacuum source (not shown). Gas inlets and gas outlets are connected to corresponding nozzles 334 (only ~~one~~<sup>one</sup> set seen in this figure). X

Another difference resides in the provision of a vacuum-forming cup 604 connected through tube 606 to the vacuum source. The vacuum-forming cup 604 is axially displaceable by means of piston 610 and is adapted for ~~a~~<sup>a</sup> sealing X  
15 engagement with a bottom surface of holder 304, by means of O-ring 612.

Bores 312 lead into the interior of vacuum-forming cup 604.

In operation, a vacuum forming cup is attached to the bottom of holder 304 and the vacuum source is connected leading to the formation of a vacuum within the confined space. In addition, the vacuum within the interior of vacuum-forming  
20 cup 604 ensures that the container body 306 does not collapse from the vacuum applied at its interior.

Apart from the above noted differences, the operation of an apparatus in accordance with this embodiment is essentially the same as the apparatus in accordance with the embodiment described above.

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## CLAIMS:

1. A method for packaging a product in a hermetically sealed container having a cup-shaped rigid or semi-rigid body 106 with a rim 107 fitted with a closure <sup>124</sup> 200, the method comprising:
  - 5 (a) introducing the product into said cup-like shaped body 106;
  - (b) forming an isolated space 204 with a gas inlet 134 and a gas outlet 112. the space 204 defined between said body 106 and a closure-forming member 200 adjacent to and with a clearance from said rim 107;
  - 10 (c) introducing a replacement gas through said inlet 134 to replace at least a substantial portion of gas originally contained in said isolated space 204; and
  - (d) displacing at least one of said body 106 or said closure-forming member 200 towards the other of the two members to close said clearance and to attach the closure-forming member <sup>200</sup> to said rim 107, and hermetically attaching the two to one another to form a gas-tight ~~stock~~ seal.
  - 15
2. A method according to Claim 1, wherein said product is a pasty material.
3. A method according to Claim 1 or 2, wherein said product is a food product.
- 20 4. A method according to Claim 1, wherein the closure-forming member <sup>200</sup> is a film.
5. A method according to Claim 1, wherein the gas outlet is formed by bores <sup>112</sup> ~~211~~ leading from the isolated space 204 to the external atmosphere.
6. A method according to Claim 1, wherein the gas outlets are bores 312 in gas communication with a vacuum source ~~604~~.
- 25 7. An apparatus for forming a hermetically sealed product-containing container, the container having an essentially cup-like shaped body 106 with rim <sup>124</sup> 107 fitted with a closure <sup>312</sup> 200; the product not filling the entire container leaving residual space ~~204~~ therein; the apparatus comprising:

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- a holder 104 for holding said container body 106;
- a spacer member 130 <sup><-> and</sup> sealingly engageable with said holder 104 and with a closure-forming member <sup>and</sup> having an opening 132 in a state of seal engagement of said spacer member 130 with said holder 104 and said closure-forming member 200, said opening 132, said container body 106 and said closure-forming member 200, define together <sup>an</sup> ~~the~~ isolated space 204;
- a gas inlet 134 and a gas outlet 112 for introducing a replacement gas into said isolated space 204, and exhausting gas therefrom, respectively; and
- a sealing mechanism comprising a displacing arrangement for displacing one or both of said container body 106 and said closure-forming member 200 towards one another and attaching them to one another in a gas-tight fashion.

8. An apparatus according to Claim 7, wherein said holder 104 has an opening 108 for receiving <sup>container</sup> ~~the~~ body 106 of the container.

9. An apparatus according to Claim 8, wherein the opening 108 of the holder 104 is fitted with an axially projecting skirt 110 for engagement with <sup>the</sup> ~~a~~ rim 107 of the container 106.

10. An apparatus according to Claim 7, wherein the holder 104 is provided with bores 112, serving as gas outlets.

11. An apparatus according to Claim 7, wherein said spacer member 130 has gas inlet nozzles 134 formed so they open into said opening 132 for introducing a replacement gas into a sealed space.

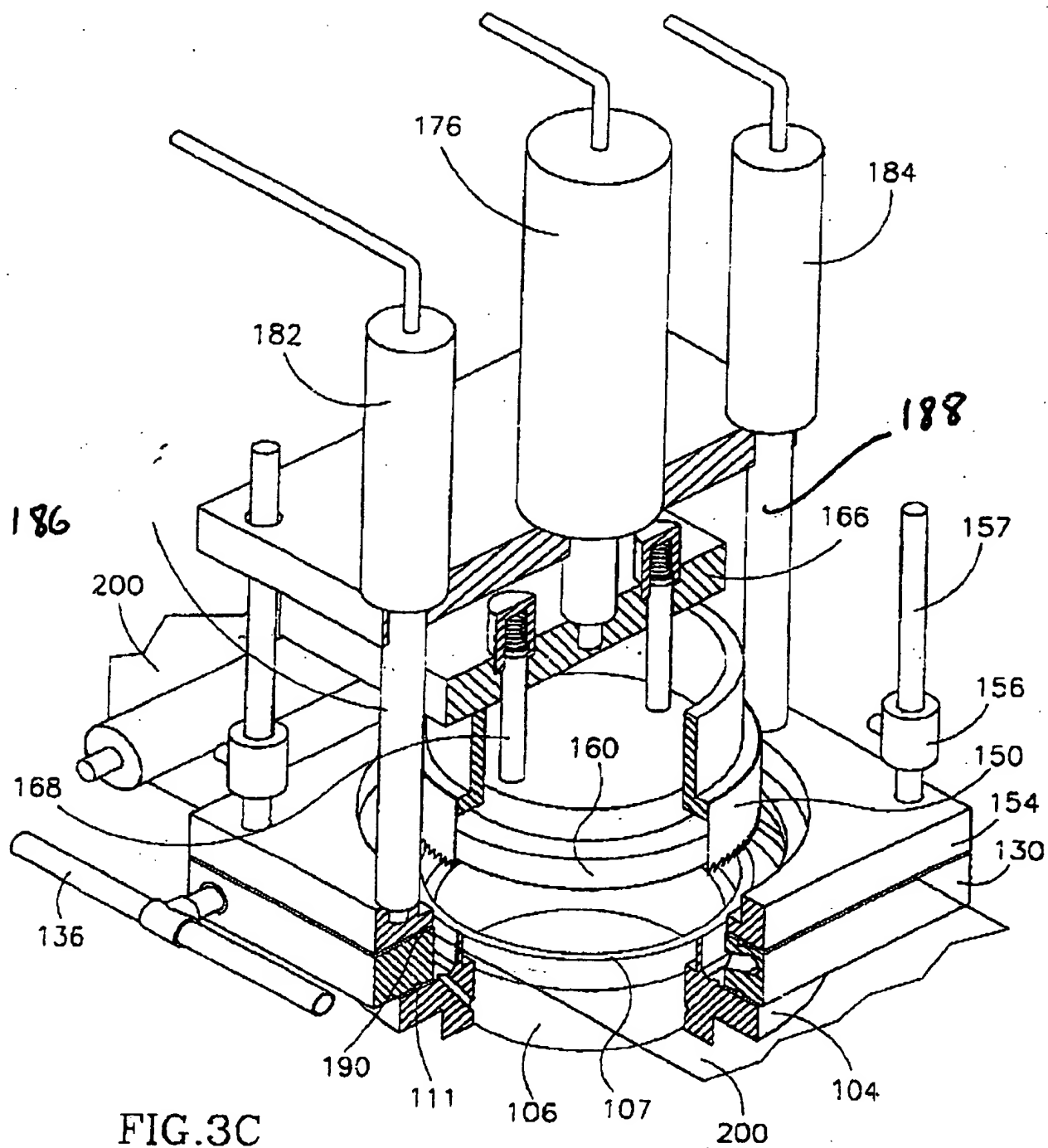
12. An apparatus according to Claim 7, wherein said sealing mechanism displaces said closure <sup>forming</sup> ~~member~~ 200 to sealingly engage said rim <sup>132</sup> ~~107~~ through the opening <sup>132</sup> ~~107~~ of said spacer member 130.

AMENDED SHEET

13. An apparatus according to Claim 1, wherein said closure <sup>forming</sup> member is a heat weldable film ~~200~~. said container body 106 is made of a plastic material, and the engagement of the film to the container body's rim is by means of heat welding.
14. An apparatus according to Claim 13, comprising a trimming member 180  
5 for trimming edges of the film 200 after the heat welding.
15. An apparatus according to Claim 7, wherein said gas outlet is connected to a vacuum source ~~606~~.
16. An apparatus according to claim 14, wherein the trimming member 180 and a heat sealing plate 160 of the sealing mechanism are axially displaceable through  
10 an opening in the spacer member 130.

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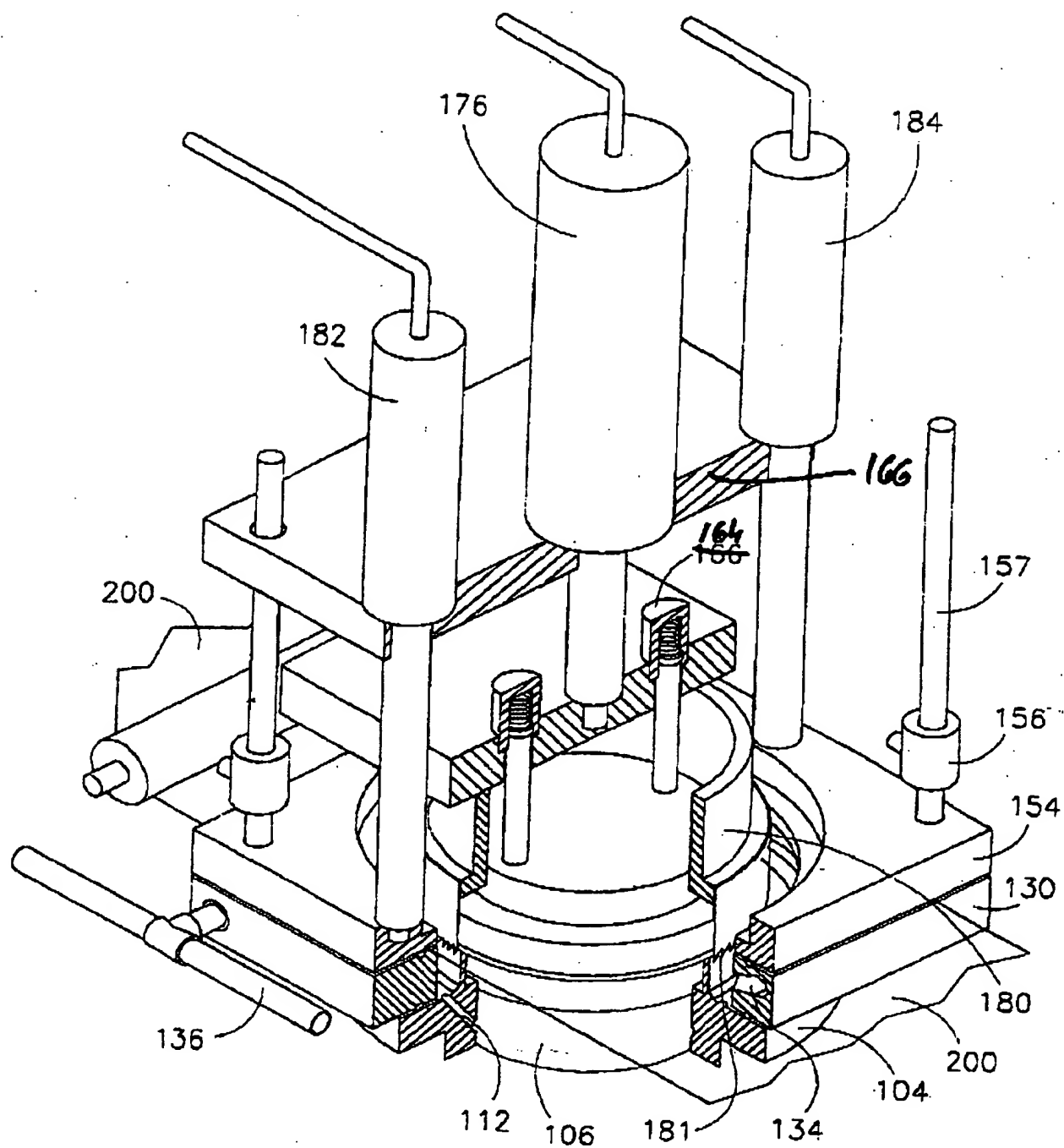
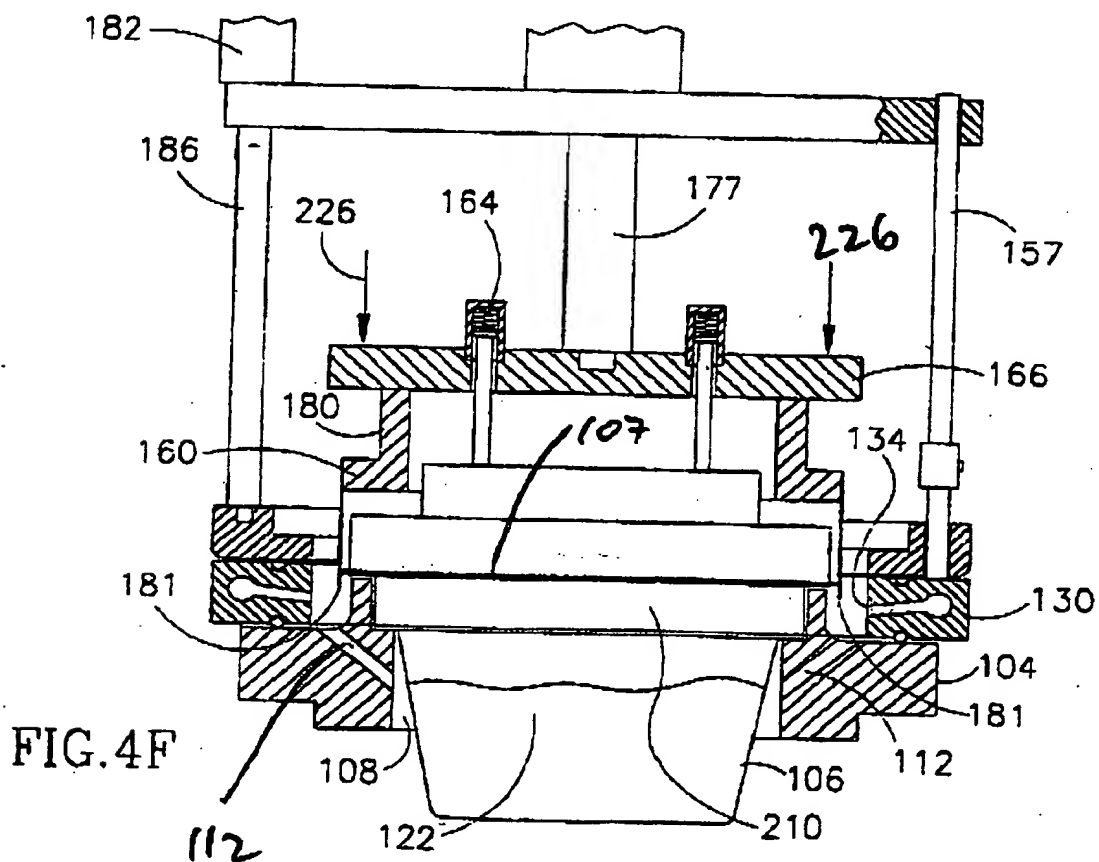
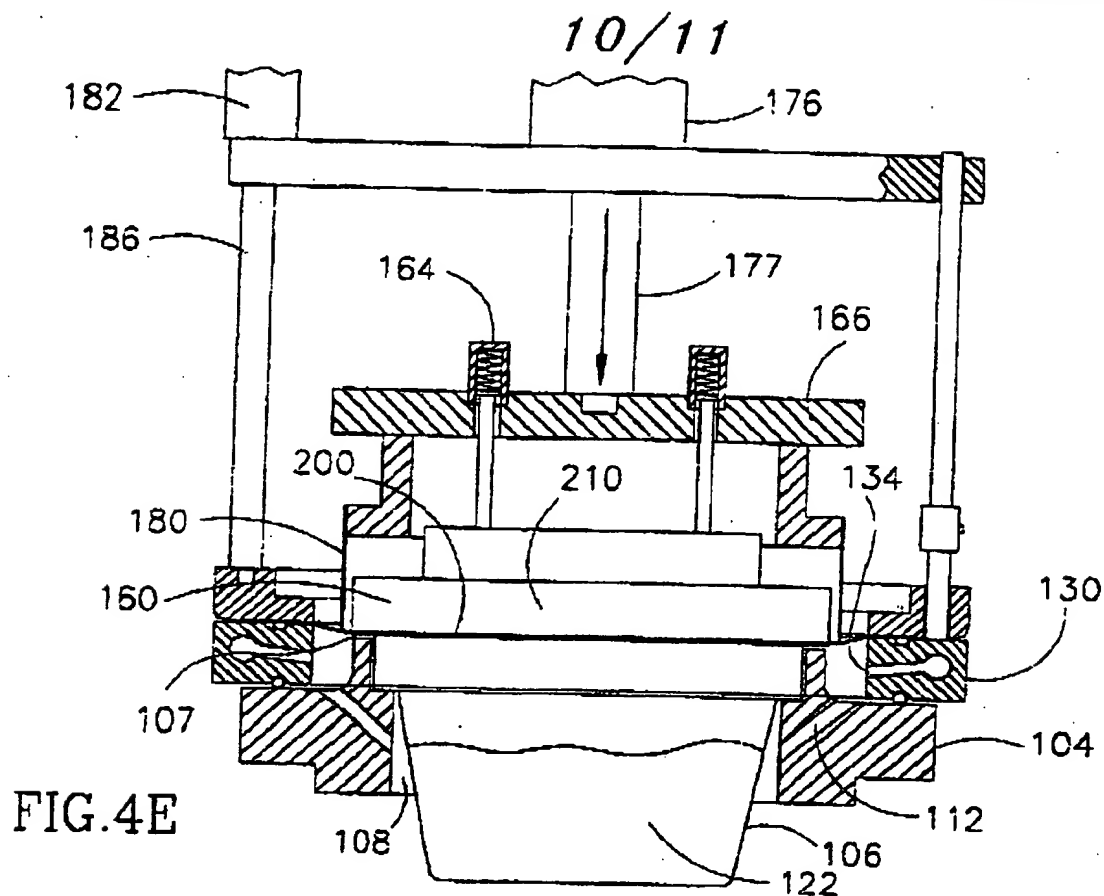


FIG. 3D

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# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>123419.4 LK</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/IL 00/ 00114</b>	International filing date (day/month/year) <b>23/02/2000</b>	(Earliest) Priority Date (day/month/year) <b>24/02/1999</b>
Applicant <b>HEFESTUS LTD. et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

**4D**

☐ None of the figures.



# INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL 00/00114

## Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

Line 3: "...body (106)..."

Line 4: "...space (204)...inlet (134)...outlet (112)..."

Line 5: "...member (200)...rim (107)..."

In line 10 the word "steel" shall be replaced with "seal"

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## PACKAGING METHOD AND APPARATUS

### FIELD OF THE INVENTION

The present invention concerns generally to a method and apparatus for packaging a product in a hermetically sealed container. The method and apparatus of the invention are particularly applicable to the packaging of food products, 5 medical supplies or devices, although not limited to these applications.

### BACKGROUND OF THE INVENTION

Very often a product contained within a container does not fill the entire container's space with the remaining space (to be referred to herein as the "*residual space*") containing a gas. Often, the gas's composition plays a role in the product's 10 shelf life. This is the case, for example, in containers holding food products. Air, which contains about 21% oxygen, facilitates growth and development of microorganisms that degrade the food product. There are many apparatuses and method which have been proposed and developed aimed at replacing the air in the residual space with another gas having a desired composition. For example, in the 15 case of food products such a replacement gas is typically nitrogen or carbon dioxide.

In the context of this writing the gas which is introduced into the container to fill the residual space will be referred to herein as the "*replacement gas*". As will no doubt be appreciated, the nature of the replacement gas depends on the type 20 of product and the type of desired effect. In the case of food products, a replacement gas will be a gas which has a composition such that it does not permit growth and development of microorganisms, particularly a gas essentially devoid of oxygen. In the case of other kinds of products the replacement gas may have a

variety of different gas composition, for example: consisting of a chemically inert, e.g. a noble gas; consisting of a gas with a certain surface activity to treat or prepare the product; may be a disinfecting gas intending to destroy microorganisms which may be contained in or on the product; etc.

## 5 GENERAL DESCRIPTION OF THE INVENTION

The present invention is directed to a method and system for packaging a product within a container such that the residual space is substantially filled with a replacement gas. The type of container to which the invention pertains is such made from a rigid or semi-rigid body having side walls with rims defining a  
10 product-introducing opening. The container body may have a base with side walls extending therefrom; it may be conical; it may be hemispheric. Such a body of a container will be referred to herein as "*cup-like shaped body*". The cup-like shaped body may have a generally rectangular base, a circular or oval base, may be elongated or flat (having a dish-like shape), may be a container formed with a  
15 partition for separate storage of two different components in two individually sealed compartments, e.g. granola in one compartment and yogurt in the other; and a variety of different shapes. It may readily be appreciated that the invention is not limited to containers of a different shape and any container having a cup-like shaped body, as defined herein, may be filled by the use of the apparatus and  
20 method of the invention.

The term "*rigid*" or "*semi-rigid*" refers to the ability of the container self-sustaining its shape. An example of a container body with these properties is such made of tin, or preferably a container body made of a rigid plastic material of the kind typically used for a variety of food products such as dairy products. A rigid  
25 or semi-rigid body may also be a body made of a flexible material reinforced by ribs, by fold lines formed by welding, or by a variety of other reinforcing means known *per se*, imparting a shape-retaining property onto said body.

The present invention provides, by a first of its aspects, a method for packaging a product in a hermetically sealed container having a cup-shaped rigid or semi-rigid body with a rim fitted with a closure, the method comprising:

- (a) introducing the product into said cup-like shaped body;
- 5 (b) forming an isolated space with a gas inlet and a gas outlet, the space defined between said body and a closure-forming member adjacent to and with a clearance from said rim;
- (c) introducing a replacement gas through said inlet to replace at least a substantial portion of gas originally contained in said isolated space;
- 10 and
- (d) displacing at least one of said body or said closure-forming member towards the other of the two members to close said clearance and to attach the closure-forming member to said rim, and hermetically attaching the two to one another to form a gas-tight steel.

15 As will be appreciated, steps (a) and (b) may be performed one after the other in the given order; may be in their reversed order, namely first forming the isolated space and then introducing the product is introduced into the container within such space; or the two steps may be carried out simultaneously.

By its second aspect, the present invention provides an apparatus for  
20 forming a hermetically sealed product-containing container. the container having an essentially cup-like shaped body with rims fitted with a closure; the product not filling the entire container leaving residual space therein; the apparatus comprising:

- a holder for holding said container body;
- a spacer member sealingly engageable with said holder and with a  
25 closure-forming member, and having an opening; in a state of seal engagement of said spacer member with said holder and said closure-forming member, said opening, said container body and said closure-forming member, define together the isolated space;
- a gas inlet and a gas outlet for introducing a replacement gas into said  
30 isolated space, and exhausting gas therefrom, respectively; and

- a sealing mechanism comprising a displacing arrangement for displacing one or both of said container body and said closure-forming member towards one another and attaching them to one another in a gas-tight fashion.

5       The closure of the container may in principle be any closure which can be made to form a hermetically sealed attachment with the container body. In the case of a container body made of a plastic material, the closure-forming member is preferably heat weldable, for heat welding to the body's rim. Such a film is preferably a laminate as generally known in the art, for example a laminate of two  
10 plastic films, a laminate of a plastic film and aluminum foil, a laminate consisting of more than two layers, and many others, all as known *per se*. It should however be appreciated that although a closure-forming member made of a film is but one embodiment and other embodiments, such as a closure forming member made from a rigid or semi-rigid plastic material may also be employed.

15       Where said closure-forming member is a film, in order to close said clearance, at least a portion of the film will typically be pushed towards the rim of the container's body and then heat welded thereto, followed by trimming the film around the rim.

      In accordance with one, currently preferred, embodiment of the invention,  
20 the gas outlet is connected to the external atmosphere. In accordance with another embodiment, the gas outlet is connected to a vacuum source. Where a vacuum source is employed, typically but not exclusively, the vacuum is first applied, gas is drained from within said isolated space, and only after a period of time allowing for gas drainage, the replacement gas is introduced.

25       In accordance with the above preferred embodiment, said holder is a planar member formed with an opening for receiving and engaging the container body. The holder is typically provided with a skirt surrounding the opening for holding and engaging the rims of said container body.

      The gas outlet may be formed by bores in said holders, preferably bores  
30 leading from a portion adjacent said opening therein to the outside atmosphere.

Alternatively, the gas outlet may also be constituted by bores within said spacer member.

The gas inlet is typically formed within said spacer member. The gas inlet preferably comprising a plurality of nozzles. Where the gas outlet is formed in said spacer, such nozzles will usually be formed in portions of the spacer member other than portions hosting the gas outlet bores. The nozzles will usually be directed into the isolated space so as to ensure sufficient turbulence for effective flushing of the residual space with the replacement gas.

### BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, preferred embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

**Fig. 1** is an exploded view of an apparatus in accordance with a preferred embodiment of the invention.

**Fig. 2** is an isometric view of the apparatus of Fig. 1.

**Figs. 3A-4A** shows the apparatus of Fig. 1 in several operational steps, where Figs. 3A-3E are partially cut, isometric views, and Figs. 4A-4F are partial and cross-sectional longitudinal views of the apparatus in corresponding operational steps.

**Fig. 5** is an exploded view of an apparatus in accordance with another embodiment of the invention.

### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is first being made to Figs. 1 and 2 showing an apparatus in accordance with an embodiment of the invention. Fig. 1 shows the apparatus generally designated **100**, in an exploded view. Fig. 2 shows an apparatus as a workstation in a packing line generally designed **102**. The apparatus **100** comprises, as can best be seen in Fig. 1, a holder **104** for holding a rigid or semi-rigid cup-shape container body **106**, received within opening **108** fitted with an upright

skirt 110. Holder 104 is held in accordance with one embodiment of the invention, on a revolving feeding carousel 120 seen in Fig. 2.

Three holders are seen in Fig. 2, the first designated 104', accommodating a container filled with a pasty substance 122 prior to its introduction to  
5 apparatus 100; the second designated 104'' being situated and forming a functional part of workstation 100; the third designated 104''' accommodating a sealed container exiting from workstation 100' sealed with a closure 124. It is thus apparent that carousel 102 isolates in the direction of arrow 126.

As will be appreciated, although the invention will be described herein with  
10 particular reference to the application for packaging a pasty-food product, particularly a dairy product, it is clear that the invention is not limited thereto and it applies, *mutatis mutandis*, to packaging of a variety of other food products, as also defined above.

Holder 104 is formed with gas outlet bores 112.

15 Apparatus 100 further comprises a spacer member 130 formed with a central opening 132, there being a plurality of gas inlet nozzles 134 pointing towards the opening's interior. Gas nozzles 134 are in flow communication with replacement gas inlet pipe 136, connected to a source of replacement gas (not shown). In the case of a food product, the replacement gas is typically nitrogen or carbon dioxide.

20 The apparatus further comprises a sealing and trimming mechanism 150 comprising a film pressing plate 154; displacement limiting members 156 fitted over axial rods 157, limiting upwards displacement of plate 154; a film displacement and heat welding plate 160 having two bores 162 engaged with the end 168 of a spring biased piston rod 164 held by plate 166. Plate 166 is engaged at  
25 its bore 170 to the end of pneumatic or hydraulic piston rod 176 and axially displaceable thereby. The apparatus further has a trimming member 180.

Two pneumatic or hydraulic piston members 182 and 184 with piston rods 186 and 188, respectively are provided, and are connected, through respective bores 190 and 192 to pressing plate 154.



As can best be seen in Fig. 2, the apparatus is fed with a continuous film 200 constituting a closure-forming member, which extends between spacer 130 and film pressing plate 154. In a manner to be described further below, the used film exiting the apparatus and fed to a pickup spool (not shown) has cutouts 202  
5 resulting from cutting out a portion used for closure of the container.

The operation of the apparatus will now be described with reference to Figs. 3A-4F.

A first step of operation can be seen in Figs. 3A and 4A. Container body 106, having in this specific embodiment inverted frustoconical shape, is  
10 received within holder 104 with the container's rim 107 resting over skirt 110. A film sheet 200 is tensioned between the spacer member 130 and film pressing plate 154 with sealing and trimming mechanism 150 being in a state such that plate 160 is distanced from the film. Film pressing plate 154 is displaced axially in its downward direction by means of the pneumatic or hydraulic pistons 182 and  
15 184, extracting and retracting the respective piston rods 186 and 188 and which are articulated at bores 190 and 192, respectively to the plate 154.

At a next stage seen in Figs. 3B and 4B, the holder 104 and the remaining part of apparatus 100 are mutually displaced (either by elevating holder 104 or by lowering the reigning parts of the apparatus) so as to bring to engagement of spacer  
20 member 130 with peripheral portion 109 (Fig. 4A), with an O-ring 111 fitted within a groove at a bottom face of spacer member 130, ensuring that the attachment will be in a gas-tight manner (not permitting gas passage through interface between these two bodies.

In a next step shown in Figs. 3C and 4C, pressing plate 154 is lowered by  
25 means of piston rods 186 and 188, whereby the film is pressed between juxtaposed faces of plate 154 and upper face of spacer 130. The O-ring 190 received within groove in the upper face of spacer member 130, ensures a gas-tight seal between film 200 and the spacer member. In this manner, an isolated space 204 defines

between the container body 106, the film 200 and wall surfaces of holder 104 and spacer member 130.

Container body 106 contains a pasty food product, e.g. a dairy product 122 filled up to a certain level and leaving a residual space 210 between the upper face  
5 of the pasty food product 122 and the container's rim 107.

In the next step, seen in Fig. 4D, a replacement gas is introduced through nozzles 134 to generate a turbulent flow represented schematically by solid, curved arrowed lines 216, resulting in flushing of the residual space with the replacement gas. At the same time, gas is evacuated to the external atmosphere through  
10 bores 112, as represented schematically by dashed curved arrowed lines 218. In this specific embodiment the nozzles are at a level which is below that of the rim 107 of the container. This is in order to avoid direct blow of air jets on the food product which can cause the formation of an aerosol which is undesired. It should however be appreciated that this position of the nozzle is but an example and in other  
15 embodiments there may be other positions of the nozzles including such above the rim's level.

A subsequent step can be seen in Figs. 3D and 4E in which a sub-assembly consisting of plate 166, welding plate 160 and trimming member 180 is lowered towards the film 200, pushing the film 200 downwards to tightly engage rim 107  
20 while the heat generated by plate 160 caused the film to weld to the rims. Plate 160 is downwardly biased by means of coiled-spring pistons 164 and thus the lower face of member 160 is at a lower level than the cutting edge 181 of trimming member 180. This axial displacement of the sub-assembly is achieved by means of piston rod 177 extending out of piston member 176.

25 At a next step, seen in Figs. 3E and 4F this sub-assembly continues its downward movement, represented by arrows 226 in Fig. 4F, causing compression of the spring within piston 164, bringing to an additional downward pressure for better sealing of film 200 onto rim 107, this downward displacement bringing to lowering of trimming edge 181 of trimming member 180 so as to trim film 200.

Thereby, a container **122**, where the residual space **210** is filled with the replacement gas, is formed.

Reference is now being made to Fig. 5 showing another embodiment in accordance with the invention. The apparatus **300** in accordance with this  
5 embodiment is identical at most of its components to the embodiment of Fig. \_\_\_ and only the differences will be outlined hereinbelow. Hereinbelow, when reference will be made to like components, they will be designated by the same reference numeral as used in the embodiment described above, shifted by **200**.

Spacer member **330** is provided with a replacement gas inlet **336** and a gas  
10 outlet **600** leading to a vacuum source (not shown). Gas inlets and gas outlets are connected to corresponding nozzles **334** (only once set seen in this figure).

Another difference resides in the provision of a vacuum-forming cup **604** connected through tube **606** to the vacuum source. The vacuum-forming cup **604** is axially displaceable by means of piston **610** and is adapted for a sealing  
15 engagement with a bottom surface of holder **304**, by means of O-ring **612**.

Bores **312** lead into the interior of vacuum-forming cup **604**.

In operation, a vacuum forming cup is attached to the bottom of holder **304** and the vacuum source is connected leading to the formation of a vacuum within the confined space. In addition, the vacuum within the interior of vacuum-forming  
20 cup **604** ensures that the container body **306** does not collapse from the vacuum applied at its interior.

Apart from the above noted differences, the operation of an apparatus in accordance with this embodiment is essentially the same as the apparatus in accordance with the embodiment described above.

**CLAIMS:**

1. A method for packaging a product in a hermetically sealed container having a cup-shaped rigid or semi-rigid body **106** with a rim **107** fitted with a closure **200**, the method comprising:
  - 5 (a) introducing the product into said cup-like shaped body **106**;
  - (b) forming an isolated space **204** with a gas inlet **134** and a gas outlet **112**, the space **204** defined between said body **106** and a closure-forming member **200** adjacent to and with a clearance from said rim **107**;
  - 10 (c) introducing a replacement gas through said inlet **134** to replace at least a substantial portion of gas originally contained in said isolated space **204**; and
  - (d) displacing at least one of said body **106** or said closure-forming member **200** towards the other of the two members to close said  
15 clearance and to attach the closure-forming member to said rim **107**, and hermetically attaching the two to one another to form a gas-tight steel.
2. A method according to Claim 1, wherein said product is a pasty material.
3. A method according to Claim 1 or 2, wherein said product is a food product.
- 20 4. A method according to Claim 1, wherein the closure-forming member is a film.
5. A method according to Claim 1, wherein the gas outlet is formed by bores **211** leading from the isolated space **204** to the external atmosphere.
6. A method according to Claim 1, wherein the gas outlets are bores **312** in gas  
25 communication with a vacuum source **604**.
7. An apparatus for forming a hermetically sealed product-containing container, the container having an essentially cup-like shaped body **106** with rims **107** fitted with a closure **200**; the product not filling the entire container leaving residual space **204** therein; the apparatus comprising:

- a holder **104** for holding said container body **106**;
  - a spacer member **130** sealingly engageable with said holder **104** and with a closure-forming member, and having an opening **137**: in a state of seal engagement of said spacer member **130** with said holder **104** and said closure-forming member **200**, said opening **132**, said container body **106** and said closure-forming member **200**, define together the isolated space **204**;
  - a gas inlet **134** and a gas outlet **112** for introducing a replacement gas into said isolated space **204**, and exhausting gas therefrom, respectively; and
  - a sealing mechanism comprising a displacing arrangement for displacing one or both of said container body **106** and said closure-forming member **200** towards one another and attaching them to one another in a gas-tight fashion.
- 15 **8.** An apparatus according to Claim 7, wherein said holder **104** has an opening **108** for receiving the body **106** of the container.
- 9.** An apparatus according to Claim 8, wherein the opening **108** of the holder **104** is fitted with an axially projecting skirt **110** for engagement with a rim **107** of the container **106**.
- 20 **10.** An apparatus according to Claim 7, wherein the holder **104** is provided with bores **112**, serving as gas outlets.
- 11.** An apparatus according to Claim 7, wherein said spacer member **130** has gas inlet nozzles **134** formed so they open into said opening **132** for introducing a replacement gas into a sealed space.
- 25 **12.** An apparatus according to Claim 7, wherein said sealing mechanism displaces said closure member **200** to sealingly engage said rims **107**, through the opening **152** of said spacer member **130**.

13. An apparatus according to Claim 1, wherein said closure member is a heat weldable film **200**, said container body **106** is made of a plastic material, and the engagement of the film to the container body's rim is by means of heat welding.
14. An apparatus according to Claim 13, comprising a trimming member **180**  
5 for trimming edges of the film **200** after the heat welding.
15. An apparatus according to Claim 7, wherein said gas outlet is connected to a vacuum source **606**.
16. An apparatus according to claim 14, wherein the trimming member **180** and a heat sealing plate **160** of the sealing mechanism are axially displaceable through  
10 an opening in the spacer member **130**.

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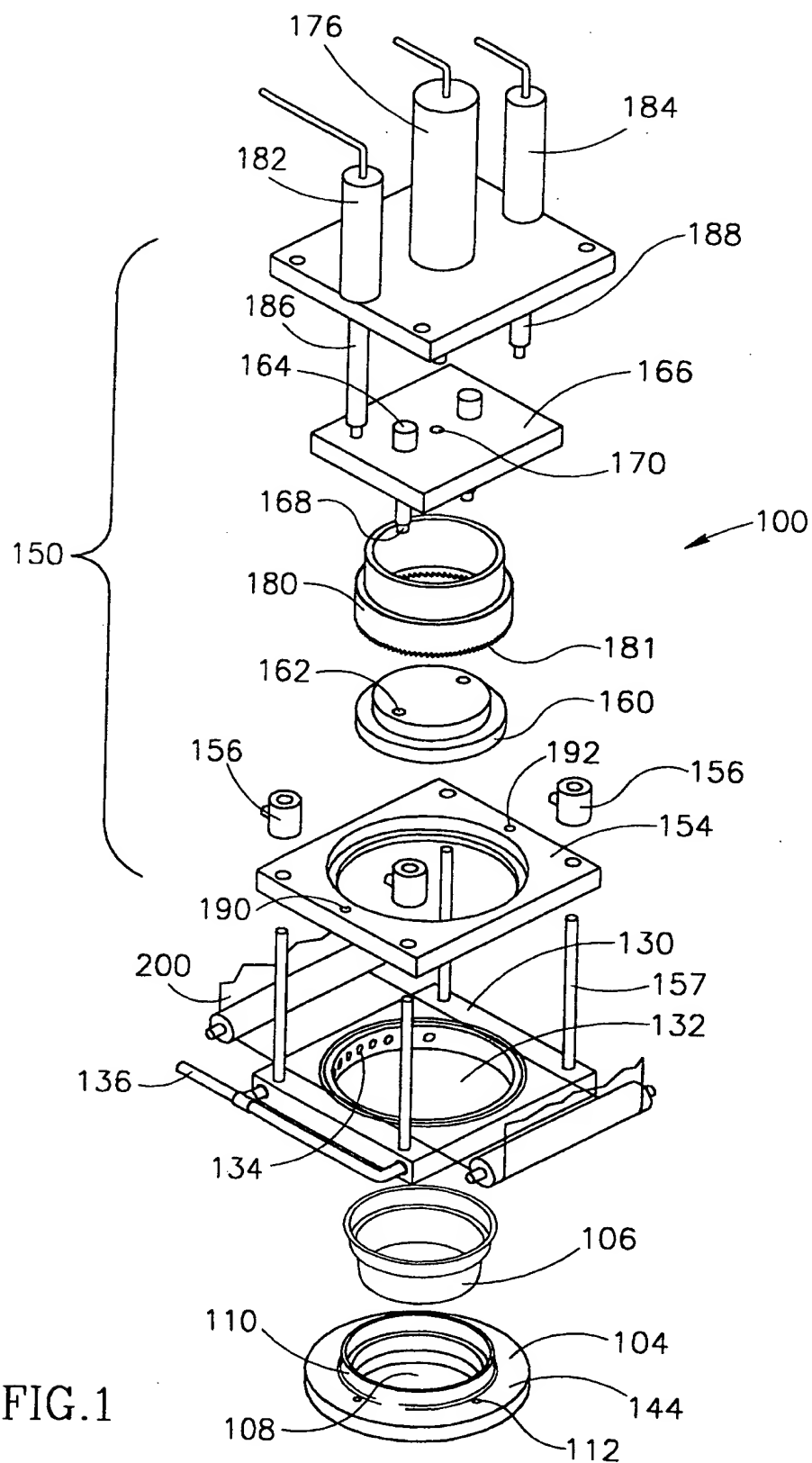
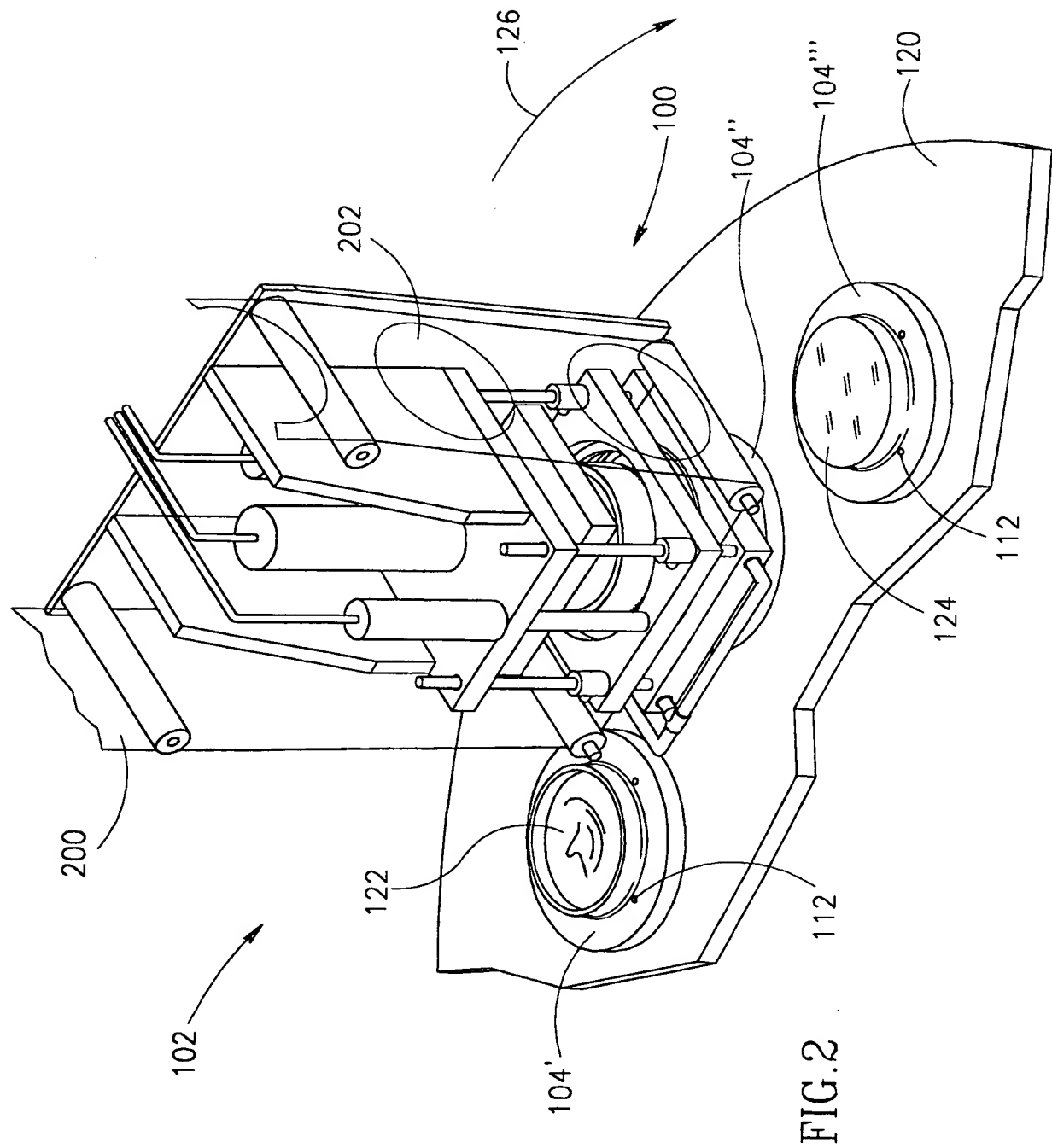


FIG.1





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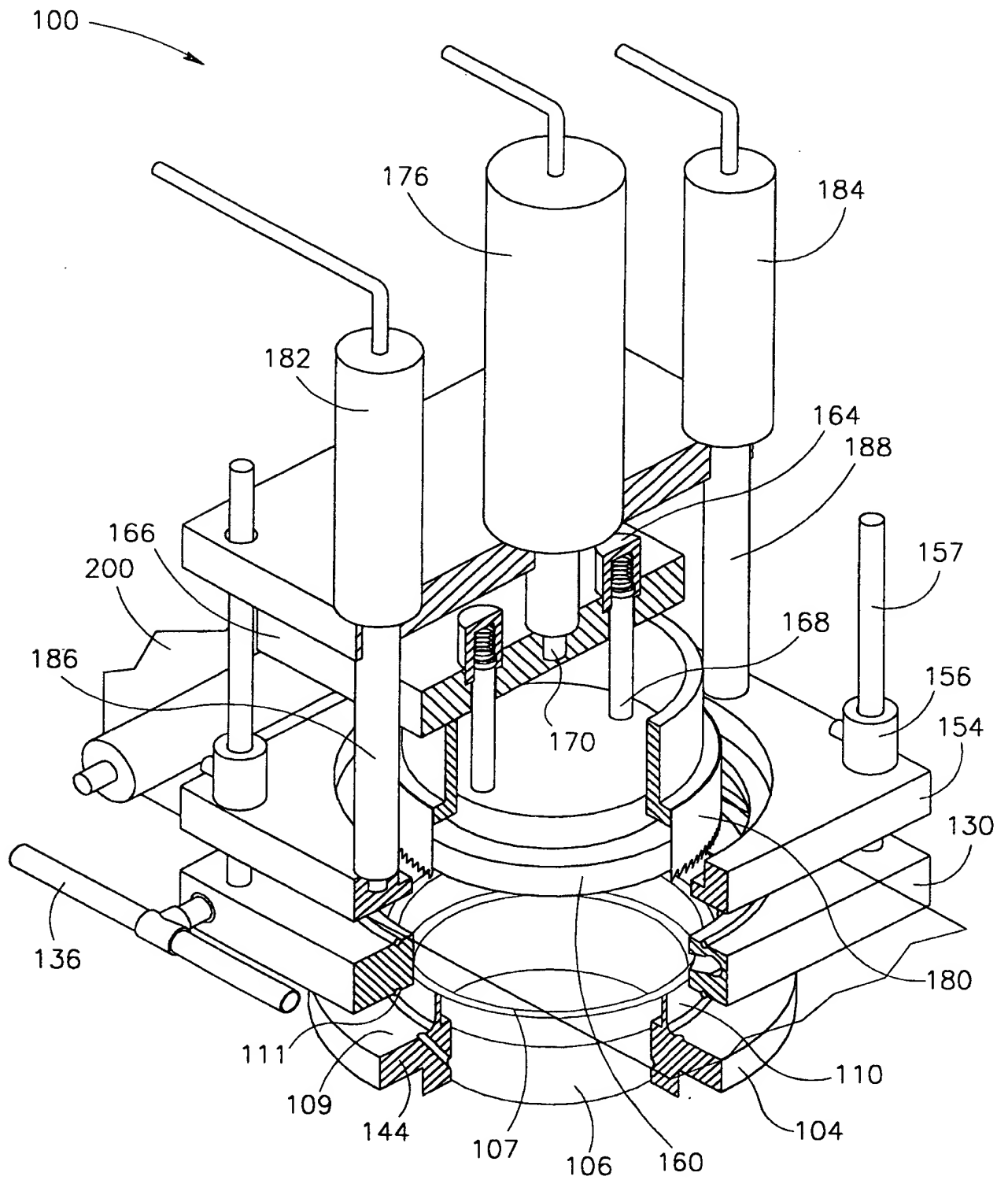
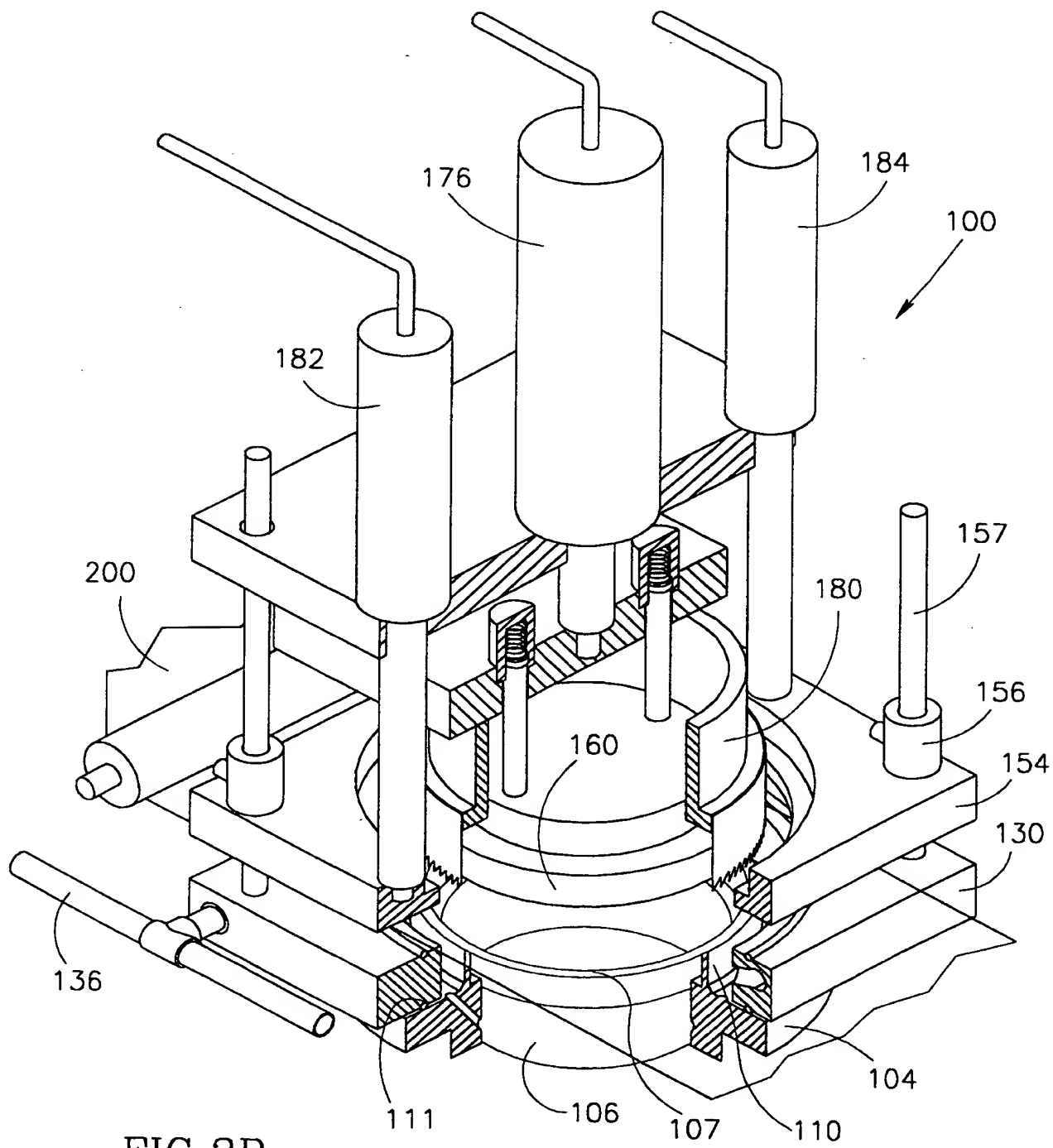
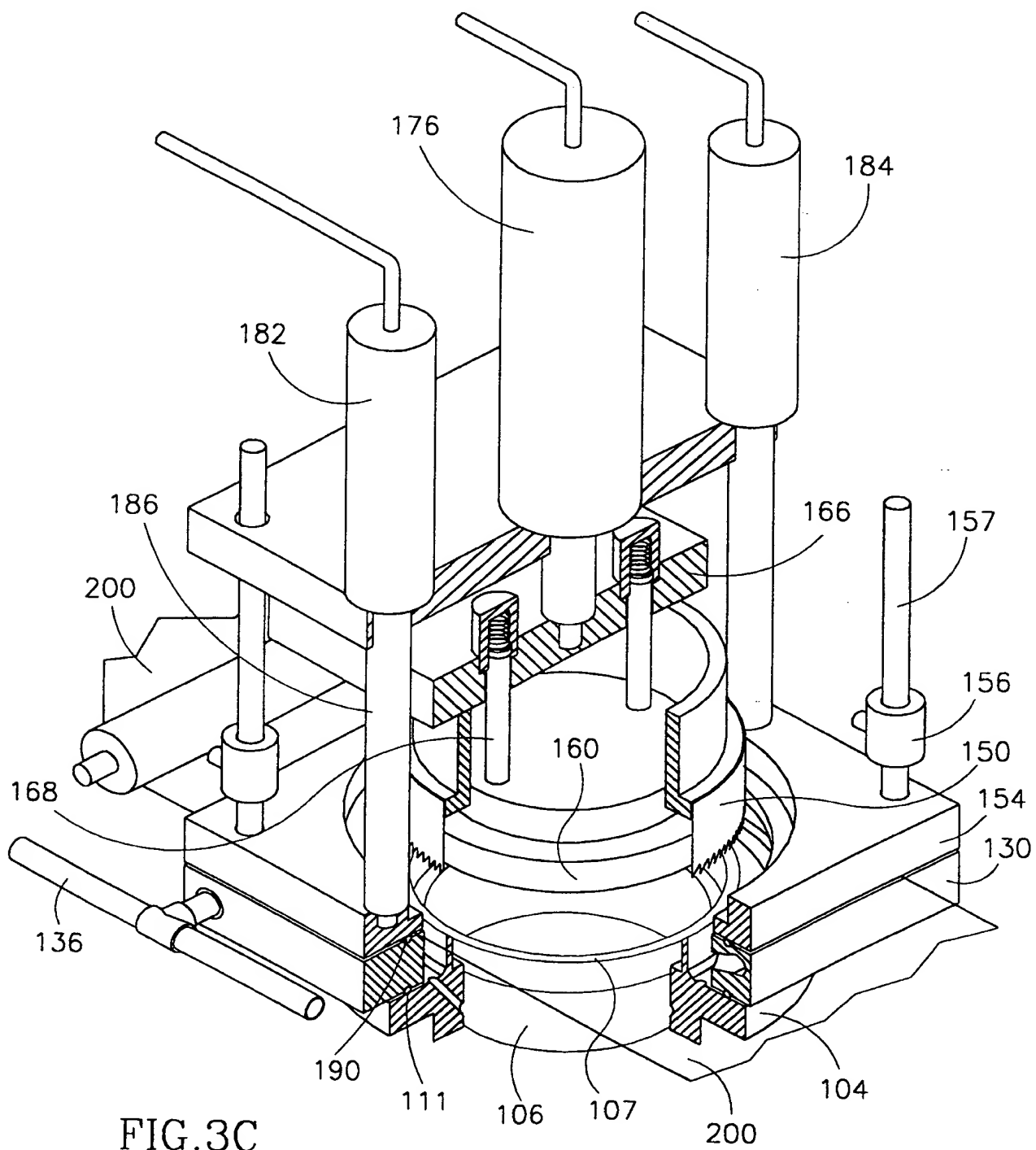


FIG.3A







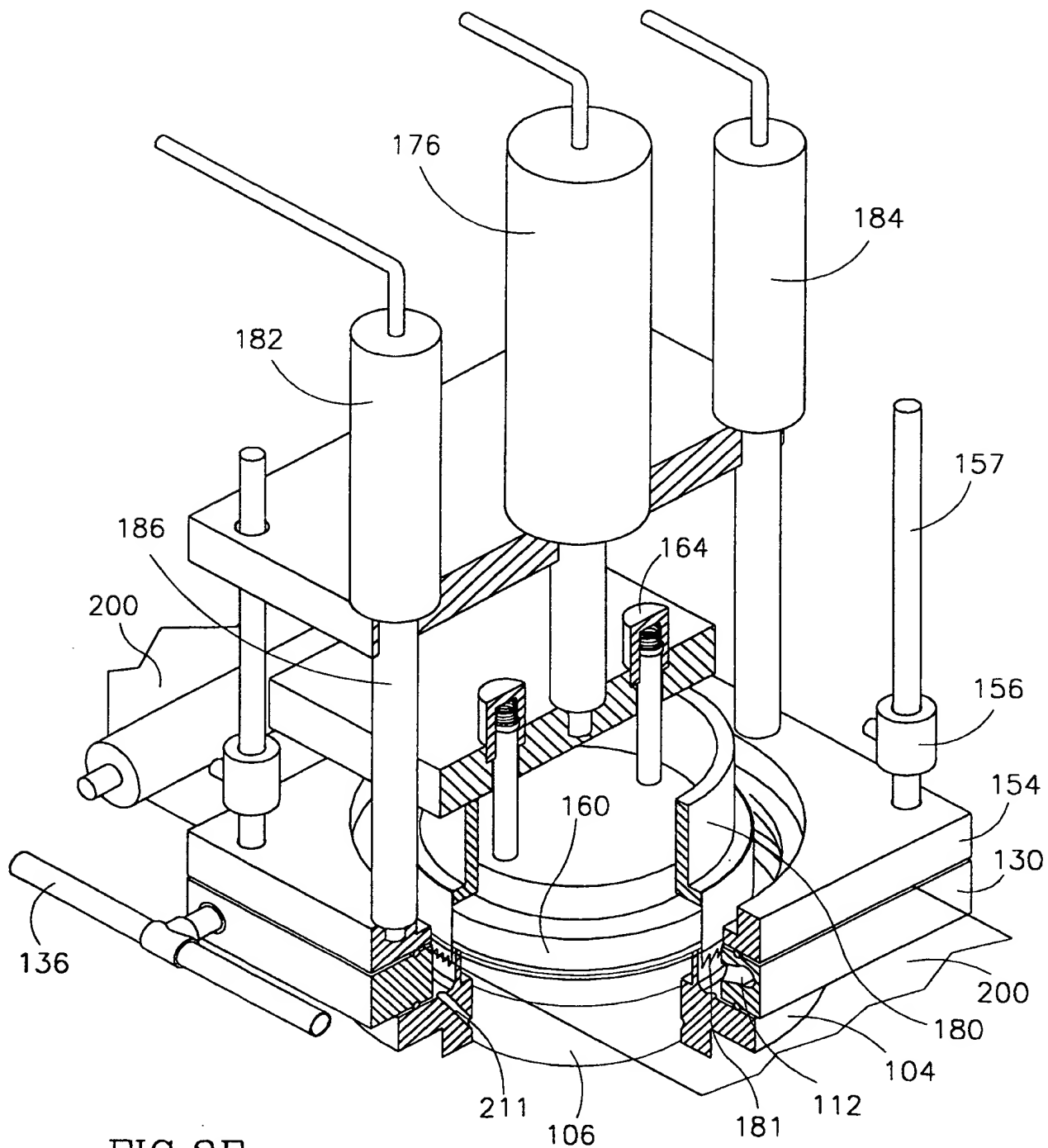
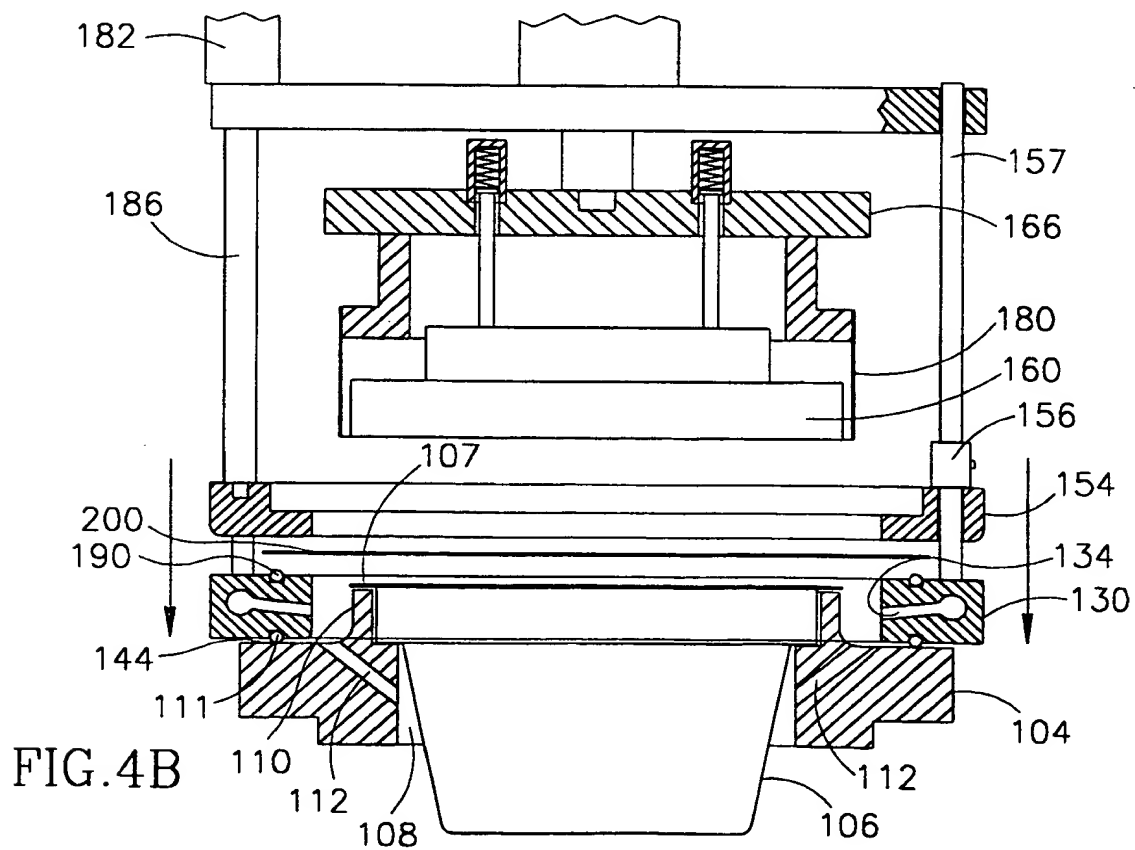
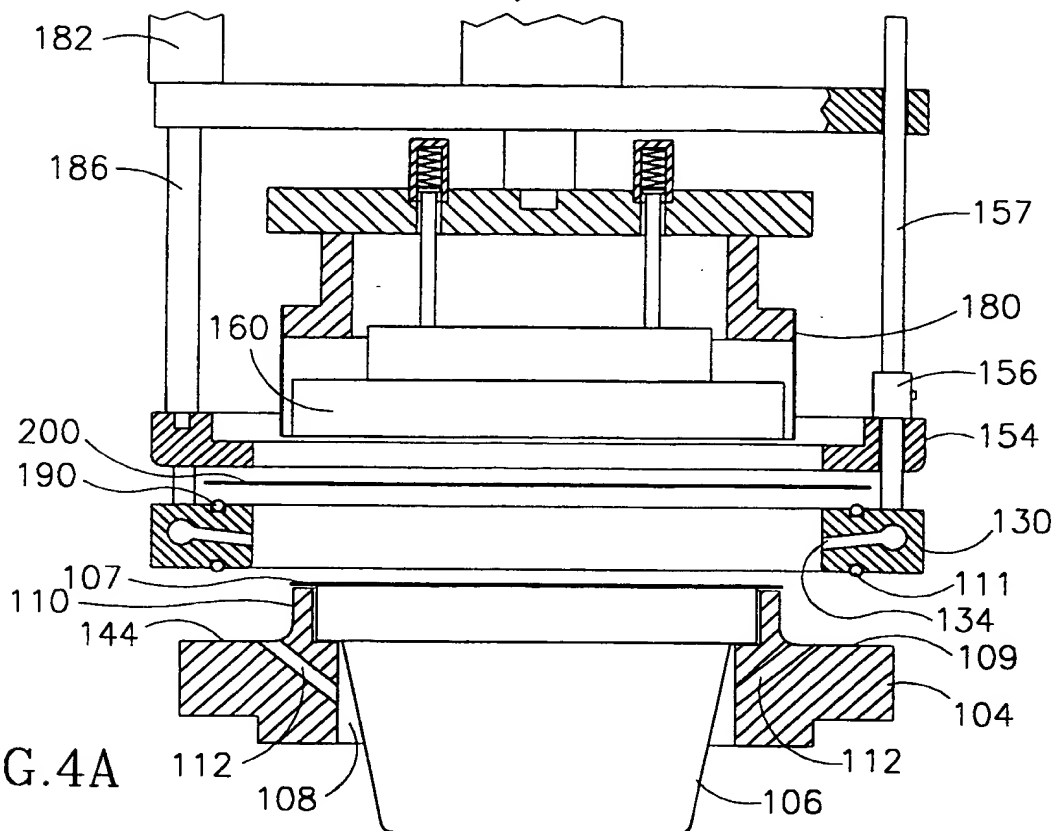
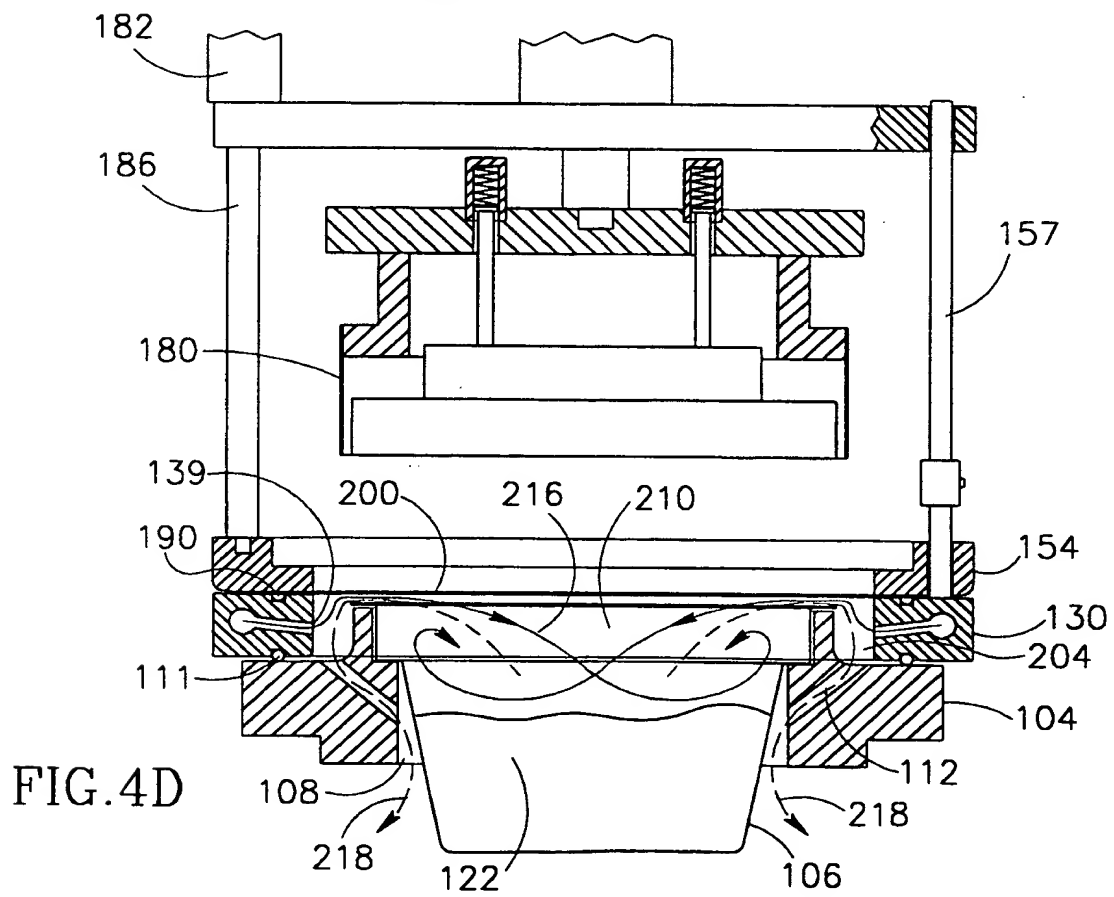
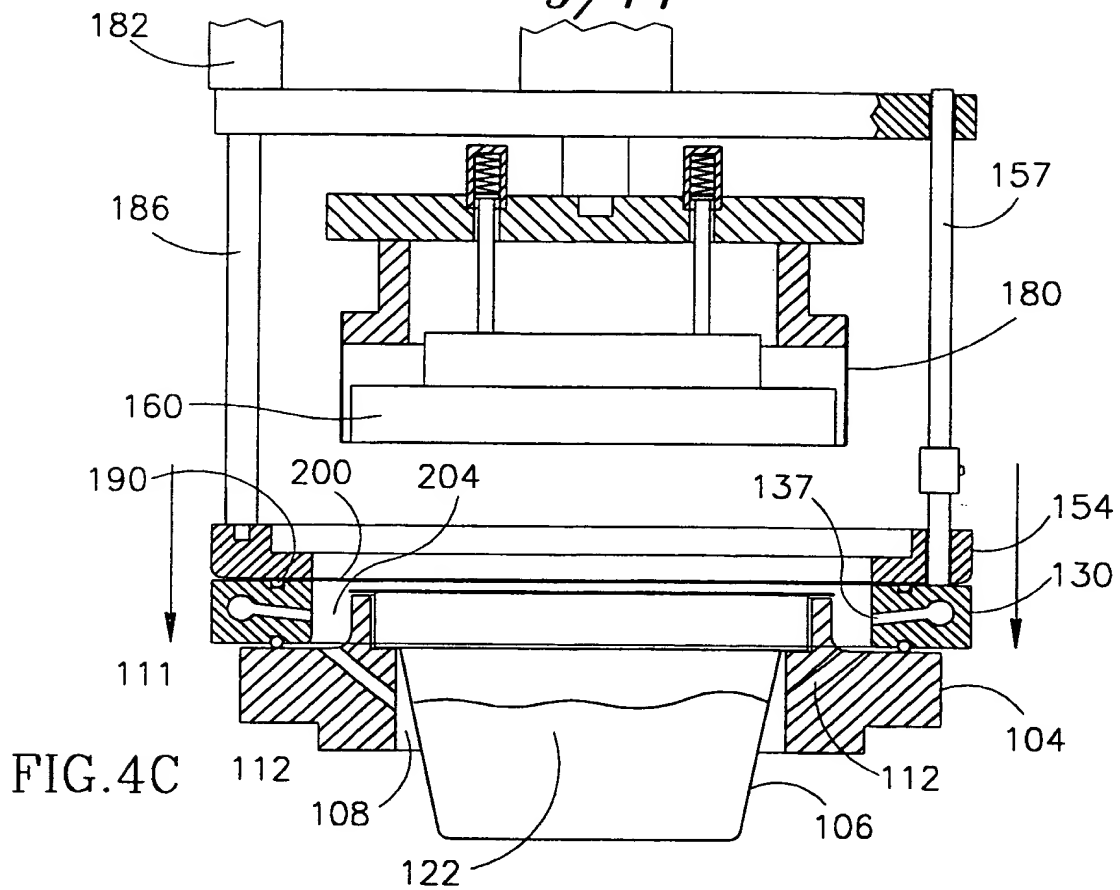


FIG. 3E

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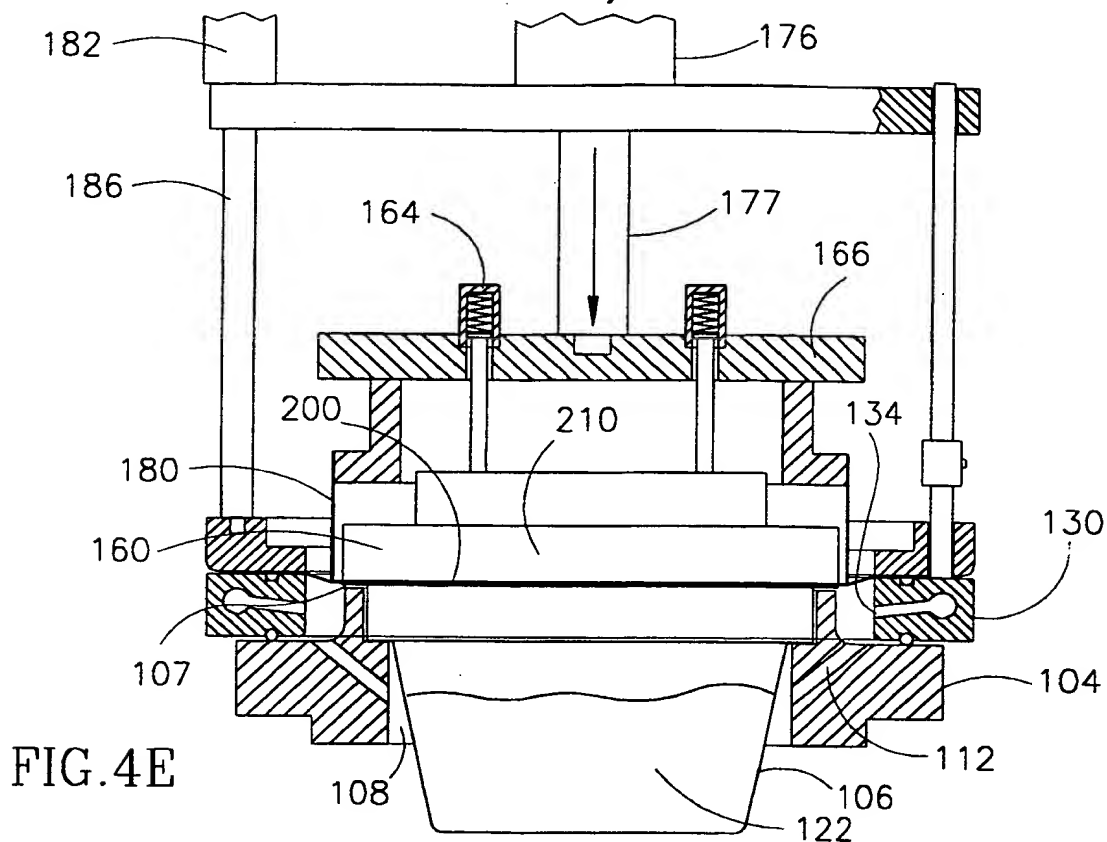


FIG. 4E

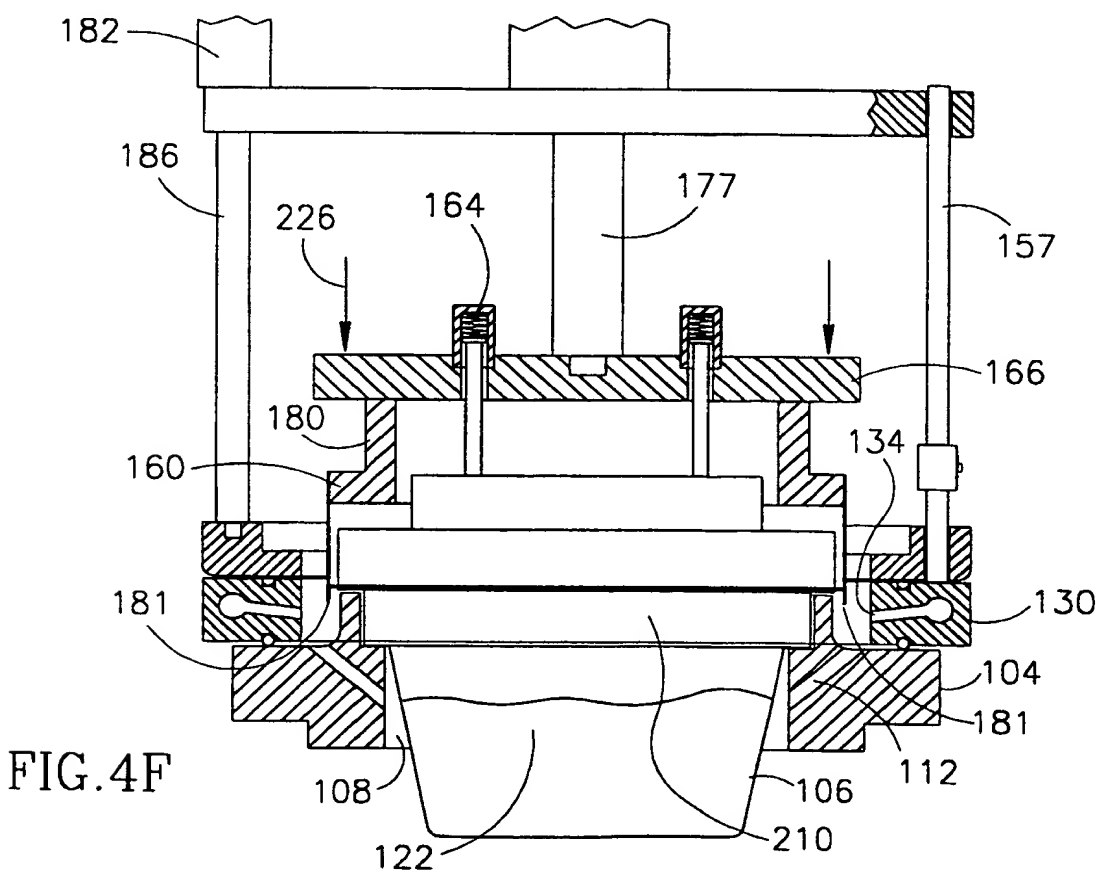


FIG. 4F



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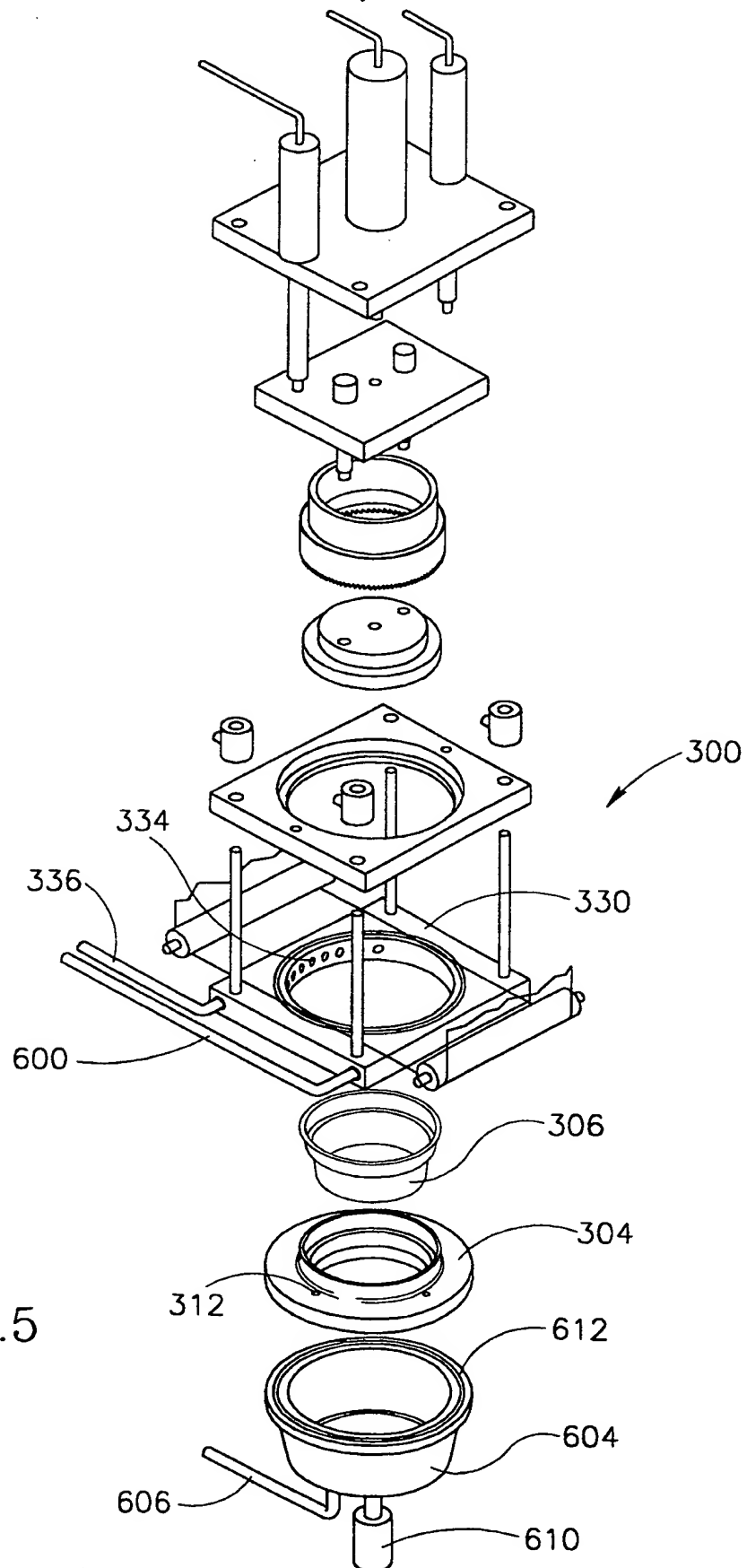


FIG.5

The present invention provides, by a first of its aspects, a method for packaging a product in a hermetically sealed container having a cup-shaped rigid or semi-rigid body with a rim fitted with a closure, the method comprising:

- (a) introducing the product into said cup-like shaped body;
- 5 (b) forming an isolated space with a gas inlet and a gas outlet, the space defined between said body and a closure-forming member adjacent to and with a clearance from said rim;
- (c) introducing a replacement gas through said inlet to replace at least a substantial portion of gas originally contained in said isolated space;
- 10 and
- (d) displacing at least one of said body or said closure-forming member towards the other of the two members to close said clearance and to attach the closure-forming member to said rim, and hermetically attaching the two to one another to form a gas-tight steel.

15 As will be appreciated, steps (a) and (b) may be performed one after the other in the given order; may be in their reversed order, namely first forming the isolated space and then introducing the product is introduced into the container within such space; or the two steps may be carried out simultaneously.

By its second aspect, the present invention provides an apparatus for  
20 forming a hermetically sealed product-containing container. the container having an essentially cup-like shaped body with rims fitted with a closure; the product not filling the entire container leaving residual space therein; the apparatus comprising:

- a holder for holding said container body;
- a spacer member sealingly engageable with said holder and with a  
25 closure-forming member, and having an opening; in a state of seal engagement of said spacer member with said holder and said closure-forming member, said opening, said container body and said closure-forming member, define together the isolated space;
- a gas inlet and a gas outlet for introducing a replacement gas into said  
30 isolated space, and exhausting gas therefrom, respectively; and

Alternatively, the gas outlet may also be constituted by bores within said spacer member.

The gas inlet is typically formed within said spacer member. The gas inlet preferably comprising a plurality of nozzles. Where the gas outlet is formed in said spacer, such nozzles will usually be formed in portions of the spacer member other than portions hosting the gas outlet bores. The nozzles will usually be directed into the isolated space so as to ensure sufficient turbulence for effective flushing of the residual space with the replacement gas.

### BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, preferred embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

**Fig. 1** is an exploded view of an apparatus in accordance with a preferred embodiment of the invention.

**Fig. 2** is an isometric view of the apparatus of Fig. 1.

**Figs. 3A-4A** shows the apparatus of Fig. 1 in several operational steps, where Figs. 3A-3E are partially cut, isometric views, and Figs. 4A-4F are partial and cross-sectional longitudinal views of the apparatus in corresponding operational steps.

**Fig. 5** is an exploded view of an apparatus in accordance with another embodiment of the invention.

### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is first being made to Figs. 1 and 2 showing an apparatus in accordance with an embodiment of the invention. Fig. 1 shows the apparatus generally designated **100**, in an exploded view. Fig. 2 shows an apparatus as a workstation in a packing line generally designed **102**. The apparatus **100** comprises, as can best be seen in Fig. 1, a holder **104** for holding a rigid or semi-rigid cup-shape container body **106**, received within opening **108** fitted with an upright

As can best be seen in Fig. 2, the apparatus is fed with a continuous film 200 constituting a closure-forming member, which extends between spacer 130 and film pressing plate 154. In a manner to be described further below, the used film exiting the apparatus and fed to a pickup spool (not shown) has cutouts 202  
5 resulting from cutting out a portion used for closure of the container.

The operation of the apparatus will now be described with reference to Figs. 3A-4F.

A first step of operation can be seen in Figs. 3A and 4A. Container body 106, having in this specific embodiment inverted frustoconical shape, is  
10 received within holder 104 with the container's rim 107 resting over skirt 110. A film sheet 200 is tensioned between the spacer member 130 and film pressing plate 154 with sealing and trimming mechanism 150 being in a state such that plate 160 is distanced from the film. Film pressing plate 154 is displaced axially in its downward direction by means of the pneumatic or hydraulic pistons 182 and  
15 184, extracting and retracting the respective piston rods 186 and 188 and which are articulated at bores 190 and 192, respectively to the plate 154.

At a next stage seen in Figs. 3B and 4B, the holder 104 and the remaining part of apparatus 100 are mutually displaced (either by elevating holder 104 or by lowering the reigning parts of the apparatus) so as to bring to engagement of spacer  
20 member 130 with peripheral portion 109 (Fig. 4A), with an O-ring 111 fitted within a groove at a bottom face of spacer member 130, ensuring that the attachment will be in a gas-tight manner (not permitting gas passage through interface between these two bodies.

In a next step shown in Figs. 3C and 4C, pressing plate 154 is lowered by  
25 means of piston rods 186 and 188, whereby the film is pressed between juxtaposed faces of plate 154 and upper face of spacer 130. The O-ring 190 received within groove in the upper face of spacer member 130, ensures a gas-tight seal between film 200 and the spacer member. In this manner, an isolated space 204 defines

between the container body 106, the film 200 and wall surfaces of holder 104 and spacer member 130.

Container body 106 contains a pasty food product, e.g. a dairy product 122 filled up to a certain level and leaving a residual space 210 between the upper face  
5 of the pasty food product 122 and the container's rim 107.

In the next step, seen in Fig. 4D, a replacement gas is introduced through nozzles 134 to generate a turbulent flow represented schematically by solid, curved arrowed lines 216, resulting in flushing of the residual space with the replacement gas. At the same time, gas is evacuated to the external atmosphere through  
10 bores 112, as represented schematically by dashed curved arrowed lines 218. In this specific embodiment the nozzles are at a level which is below that of the rim 107 of the container. This is in order to avoid direct blow of air jets on the food product which can cause the formation of an aerosol which is undesired. It should however be appreciated that this position of the nozzle is but an example and in other  
15 embodiments there may be other positions of the nozzles including such above the rim's level.

A subsequent step can be seen in Figs. 3D and 4E in which a sub-assembly consisting of plate 166, welding plate 160 and trimming member 180 is lowered towards the film 200, pushing the film 200 downwards to tightly engage rim 107  
20 while the heat generated by plate 160 caused the film to weld to the rims. Plate 160 is downwardly biased by means of coiled-spring pistons 164 and thus the lower face of member 160 is at a lower level than the cutting edge 181 of trimming member 180. This axial displacement of the sub-assembly is achieved by means of piston rod 177 extending out of piston member 176.

25 At a next step, seen in Figs. 3E and 4F this sub-assembly continues its downward movement, represented by arrows 226 in Fig. 4F, causing compression of the spring within piston 164, bringing to an additional downward pressure for better sealing of film 200 onto rim 107, this downward displacement bringing to lowering of trimming edge 181 of trimming member 180 so as to trim film 200.

Thereby, a container 122, where the residual space 210 is filled with the replacement gas, is formed.

Reference is now being made to Fig. 5 showing another embodiment in accordance with the invention. The apparatus 300 in accordance with this  
5 embodiment is identical at most of its components to the embodiment of Fig. \_\_\_ and only the differences will be outlined hereinbelow. Hereinbelow, when reference will be made to like components, they will be designated by the same reference numeral as used in the embodiment described above, shifted by 200.

Spacer member 330 is provided with a replacement gas inlet 336 and a gas  
10 outlet 600 leading to a vacuum source (not shown). Gas inlets and gas outlets are connected to corresponding nozzles 334 (only once set seen in this figure).

Another difference resides in the provision of a vacuum-forming cup 604 connected through tube 606 to the vacuum source. The vacuum-forming cup 604 is axially displaceable by means of piston 610 and is adapted for a sealing  
15 engagement with a bottom surface of holder 304, by means of O-ring 612.

Bores 312 lead into the interior of vacuum-forming cup 604.

In operation, a vacuum forming cup is attached to the bottom of holder 304 and the vacuum source is connected leading to the formation of a vacuum within the confined space. In addition, the vacuum within the interior of vacuum-forming  
20 cup 604 ensures that the container body 306 does not collapse from the vacuum applied at its interior.

Apart from the above noted differences, the operation of an apparatus in accordance with this embodiment is essentially the same as the apparatus in accordance with the embodiment described above.

- a holder **104** for holding said container body **106**;
  - a spacer member **130** sealingly engageable with said holder **104** and with a closure-forming member, and having an opening **137**: in a state of seal engagement of said spacer member **130** with said holder **104** and said closure-forming member **200**, said opening **132**, said container body **106** and said closure-forming member **200**, define together the isolated space **204**;
  - a gas inlet **134** and a gas outlet **112** for introducing a replacement gas into said isolated space **204**, and exhausting gas therefrom, respectively; and
  - a sealing mechanism comprising a displacing arrangement for displacing one or both of said container body **106** and said closure-forming member **200** towards one another and attaching them to one another in a gas-tight fashion.
- 15 **8.** An apparatus according to Claim 7, wherein said holder **104** has an opening **108** for receiving the body **106** of the container.
- 9.** An apparatus according to Claim 8, wherein the opening **108** of the holder **104** is fitted with an axially projecting skirt **110** for engagement with a rim **107** of the container **106**.
- 20 **10.** An apparatus according to Claim 7, wherein the holder **104** is provided with bores **112**, serving as gas outlets.
- 11.** An apparatus according to Claim 7, wherein said spacer member **130** has gas inlet nozzles **134** formed so they open into said opening **132** for introducing a replacement gas into a sealed space.
- 25 **12.** An apparatus according to Claim 7, wherein said sealing mechanism displaces said closure member **200** to sealingly engage said rims **107**, through the opening **152** of said spacer member **130**.

13. An apparatus according to Claim 1, wherein said closure member is a heat weldable film **200**, said container body **106** is made of a plastic material, and the engagement of the film to the container body's rim is by means of heat welding.
14. An apparatus according to Claim 13, comprising a trimming member **180**  
5 for trimming edges of the film **200** after the heat welding.
15. An apparatus according to Claim 7, wherein said gas outlet is connected to a vacuum source **606**.
16. An apparatus according to claim 14, wherein the trimming member **180** and a heat sealing plate **160** of the sealing mechanism are axially displaceable through  
10 an opening in the spacer member **130**.



FIG.4E

FIG. 4F

FIG.4C

FIG. 4D

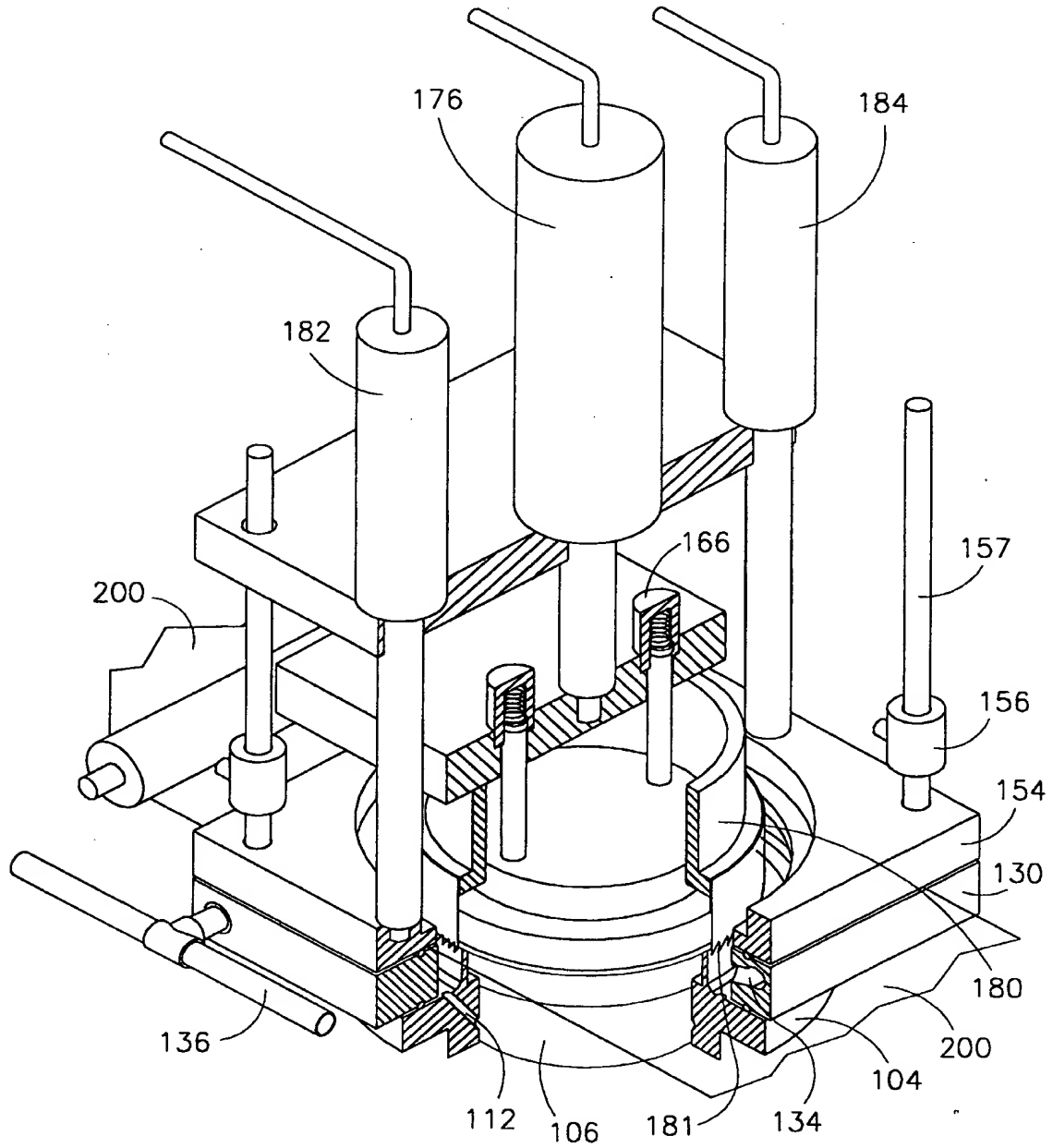


FIG. 3D

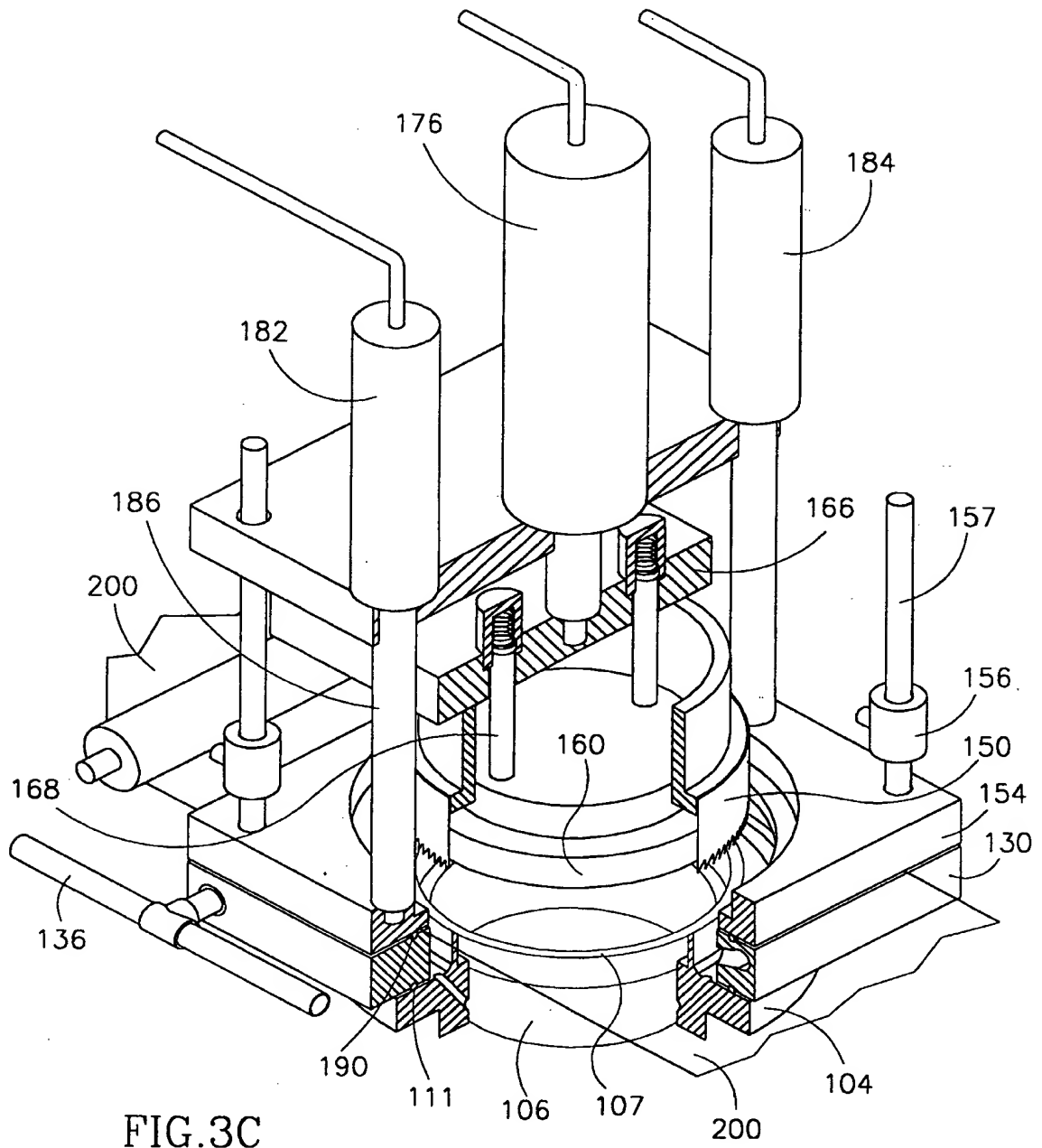


FIG. 3C